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TO

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FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS,

AND OF THE ROYAL SOCIETY OF EDINBURGH,

&c. &c.

---

Sir,

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Allow me therefore thus publicly to acknowledge how much I am, for this as for other favours,

Your much obliged,
Humble Servant,
W. JARDINE.

DUMFRIES,
*November* 16, 1814.

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## ERRATA.

Page 52, bottom of, *add* See Plate V. Figures 1, 2, 3, 4.
60, line 21, *for* second, *read* first.
86, line 6, *for* laterally, *read* also.
87, line 18, *for* hook, *read* tooth.
96, line 4, *for* applicable, *read* serviceable.
115, line 16, *for* Plate VII. *read* Plate VIII.
123, line 9, *for* Plate X. *read* Plate IX.

### *Errata in the Plates.*

Plate I. Fig. 5. The corners of the Curved Saw should have been rounded off.

Plate IV. Fig 1. The corner of the depressed part of the Divisible Trephine should have been rounded off, and the teeth of every division seen, except what are behind the depressed part. The screw on the upper part of the crown is also very coarse.

Plate V. Fig. 4. The Elevator's handle is introduced too far under the fractured part.

Plate V. *for* Fig. 3, *read* 2, *for* 4, *read* 3, *for* 2, *read* 4.

# PREFACE.

It is remarkable that the Surgical Art, which has for so many ages been practised by men of the most distinguished abilities and professional merit, should nevertheless be so very defective, not in the number, but in the fitness of its instruments even for performing many of the most common operations to which Surgeons have been accustomed.

Although, of late, Surgery has been more rapid in its progress towards the improvement of the operative part than for many ages past, it certainly has not arrived at that state which it might have done, had the improvement of its instruments kept pace with its other attainments.

It would appear that either very little, or not sufficient attention has been paid to that important branch of the art, or Surgeons must have been unaccountably unfortunate in their attempts to that purpose.

The greatest improvements in the operative part are of a very late date indeed, and appear to have been suggested either by accident, or more accurate views of the anatomical structure of the parts concerned in the operation.

It is certain that very little has been gained by the various attempts at the improvement of its instruments, which, upon a better plan, certainly would have contributed much to the improvement of the whole art.

The invention of new instruments, or the improvement of the old, generally precedes or accompanies the improvements of most other arts; and as one improvement is often conducive to another, so, we have reason to think, that a surgical instrument which improves the mode of performing one operation, may also be the means of improving the mode of performing another. But the instruments of

Surgery being hitherto so defective, have contributed very little towards the improvement of that art, less, perhaps, than the instruments of any other.

It may naturally be asked, How this extraordinary deficiency is to be accounted for, and by what means it is likely to be removed? For deficient in instruments, in comparison with all the other arts, it certainly is, as, I presume, I shall be able to prove, even in those very operations in which some of its most eminent writers seem to think otherwise, and in that opinion have treated some late attempts towards their improvement with the most unbecoming indifference. That Surgeons might improve their instruments as well as the practitioners of other arts, there can scarcely be a doubt; but that they do not, or do it at best but very slowly, is certainly the case.

The reason of Surgery being so far behind all other arts in the fitness of its instruments, is, in my opinion, that, operations happening but seldom, Surgeons are not in the habit of handling their instruments except when they are about to perform an operation, and then, perhaps, only examining them to see whether or not they are in order for the operation intended; they consequently cannot be supposed to know much about them, or be so capable of judging of their merit, or fitness for their purpose, as other professional men are to judge of theirs, who, from the nature of their employment, use them oftener. To such inexperience also may be imputed the diffidence so common to the generality of Surgeons in the choice of their instruments, and the length of time before improved instruments become generally useful. For the generality of Surgeons, till lately, not trusting to their own experience or observation, valued every proposed improvement of the kind according to the professional celebrity of the man recommending it, rather than according to the real value or fitness of the instrument itself.

It has been observed, that the inventor or improver of a surgical instrument manages it better than any body else. The observation is too true, but may, I presume, from the preceding observations, now be accounted for.

It is a rule with artificers, to accustom their apprentices to the use of their tools, not to allow them to do any thing, for a certain time, but what is conducive thereto. In that way, they acquire a practical knowledge, and a dexterity in the management of them, which they could not otherwise obtain, as well as others which they may afterwards have occasion to use, in the variety and improvement of their work, though new and unknown to them before.

Were young Surgeons also accustomed, in a similar way, to the use of such particular instruments as are more difficult to manage than others, upon such substances as they are intended to operate, (instead of human subjects, which but a few can have access to,) they would be better prepared for their future employment, and not so much at a loss in the choice of their instruments, or in knowing when they are improved, as they generally are. But so far from that, I have met with too many young Surgeons, in very responsible situations abroad, into which the emergency of the time had put them, of a very liberal education, and also, in other respects, very clever, yet so awkward in the management of those instruments that required any kind of dexterity in their use, particularly the Saw and Trephine, that I could hardly believe they had ever tried them at all, before they set about the operation intended. I found they neither knew how to set the Saw, nor when it was set; and they could not recollect of ever being told that such a direction of its teeth is sometimes necessary to fit it for its purpose, or understand it could, in that particular direction of its teeth, cut either easier or smoother. One reason why people that try to improve Surgical Instruments fail, is in not knowing the practical use of them.

Young Surgeons, when at the College, or attending the Hospitals, are generally very attentive to all the capital operations, thinking that with such insight, and a proper knowledge of Anatomy, they will themselves also be enabled to perform the same operations, without ever having handled an instrument belonging to them. But in making the trial, they find that something more than a knowledge of Anatomy, and the sight of an operation, is necessary to qualify a man for performing, even what may be thought one of the most common or simple operations in Surgery.

In Surgery, as in all other operative arts, a practical knowledge of its instruments is so necessary, that we may venture to say, hardly any one will succeed without it. It is not merely by the instructions of a tradesman, or seeing him at work, that any one will learn a trade: Whoever wishes to learn any particular trade, must first know how to handle the tools belonging to it; the cleverer he is in that respect, the sooner he will perfect himself in his intended employment; and in no operative art is a practical knowledge of its instruments more necessary than in that of Surgery.

It is neither by a knowledge of Anatomy, nor reading of operations, or even seeing them performed, that any one will become an expert operator. Before he can be expected to become dexterous in that art, he must have a practical knowledge of his instruments; and having once acquired that, with a proper knowledge of Anatomy, he will with more confidence undertake operations, which he neither before performed himself, nor saw done by others. And in those accidents, for which the profession is not provided with instruments suitable, he will likely from his own resources find a substitute, which in some circumstances has happened very successfully.

There is another advantage likely to accrue to the younger and inexperienced part of the profession, from a practical knowledge of their instruments; that is, in observing their defects, they not only are more apt to improve them, but in their attempts to do so, perhaps may find it necessary to inform themselves more particularly of the construction of the parts concerned in the operation for which the instruments are intended. They are improved in their knowledge of Anatomy, and also of their profession, more perhaps than they otherwise would, had they not been so employed.

Surgeons should not only be practically acquainted with their instruments, as other professional people are with theirs, but capable of cleaning and sharpening them. Even from that employment, they will become more expert in using them. In many situations abroad, in which a Surgeon may be placed, he cannot get his instruments either cleaned or sharpened; therefore, when once rusted or blunted, on a foreign station, he loses the use of them altogether. Even in this country, at any considerable distance from a large town, Surgeons are very much at a loss, in being obliged to send their instruments thither to be righted. The advantages, therefore, which a Surgeon will derive, in being able to clean and sharpen his own instruments, are obviously very great. Every thing for the purpose, being neither costly nor bulky, may be easily carried about with him, as they will take little more room in a medicine chest than the things necessary for keeping his razors in order. A hone, a strap, a saw-file, a key or a punch to set his saw, and a little sweet oil, are all the things necessary, and with which he can be supplied any where. He ought to have such things by him whether he can use them or not. In the army or navy he is almost sure to find men who can, and who will, instruct him how to do it, if he wishes.

It was in my professional employment as a Surgeon of the navy, that I observed the very defective forms of many Surgical Instruments used in the most important operations. Of such improvements as then occurred to me, I published an account in the Medical Journals of London for December 1802. Since that time, however, I have not only further improved and simplified the instruments alluded to, which were then rather complicated, but have also invented, or rather improved, several others, as I imagine, all of which, in a collected form, I now offer to public observation. In presenting such a work to the public, I am aware of the reception it is likely to meet with, even from such as, from their rank and credit in the profession, might be supposed the most ready to countenance any rational attempt of the kind. Yet the cold and indifferent manner in which some of the seniors of the profession have treated some late attempts for improving Surgical Instruments, of which the most expert operators of the profession acknowledge the deficiency, under an apprehension of encumbering the profession with a multiplicity of them, is scarcely credible. Fortunately for the profession, however, Surgeons, now since the operative branch has become more general, are, from their own observation and experience, more capable of judging of the instruments of their art than Surgeons formerly were. They are not, as formerly, so implicitly led by their seniors, as to abide by their *ipse dixits*, without having any opinion of their own; and many, now, judge of their instruments as of other things, from their own observation and practical knowledge. Complaints have been made against the multiplicity of the instruments of Surgery. I cannot, for my part, see from what circumstances, in the way of performing surgical operations, an apprehension of encumbering the profession with too many instruments could have originated. If a new instrument has improved the mode of performing any particular operation, or is a substitute for another not so fit for its purpose, are we, from an unfounded apprehension of multiplying the instruments of the profession, to reject what is really useful, merely on account of its being additional? The question with men of sense should be, What is the addition? Is it an improvement, or is it not? If not, reject it; otherwise, adopt it, come from what quarter it will.

In improving the method of performing surgical operations, the instruments for the purpose are more likely to be diminished in number than increased. Though a little addition may be made to one set, another set may be abridged. Here there is unavoidably a small addition of instruments made to the operation of the Trepan; but these additional instruments being required for a greater variety in that operation than could be performed by the instruments in common use, Surgeons, who approve of the plan proposed, will, of course, provide themselves for it, and those who do not approve of it, can do just as they please.

It is scarcely to be expected but that experience will in time point out defects to others, which cannot so likely be discovered by me in my present unemployed situation. If the principles on which they are constructed are but just, it will afford me all the satisfaction I hoped for, as it may be the means of exciting the attention of others to the improvement of that important branch of the Surgical art, hitherto so neglected and so defective.

The smallness of the work, I presume, will rather be in commendation of it than against it; for if it does not answer its purpose, there will be less time lost in reading it.

My intention here being merely to shew how the instruments improved are to perform the different operations for which they are severally intended, no more of the operation is described than what is really necessary for that purpose.

If any thing like what is herein mentioned has been used, or improved, in a similar way before by others, it is more than I know, or could learn from any source of information, ancient or modern, upon the subject, to which I have hitherto had access.

### ON THE

# INSTRUMENTS OF THE TREPAN;

### AND

### THE METHOD PROPOSED FOR IMPROVING THAT OPERATION.

THE operation of the Trepan, notwithstanding the length of time it has been in practice, is nevertheless, in my opinion, very defective, both in the instruments for performing it, and in the way of performing it.

For the purpose of raising a depressed portion of a bone, or discharging extravasated matter under it, it has hitherto been the practice to do it by a round perforation in the sound part of the bone. That a round perforation, in some cases, is very proper, must be allowed; but that in every case it is, or that the operator would perforate the sound part of the bone in preference to the injured, if he had instruments for performing the operation otherwise, I scarcely believe, since by perforating the sound bone, we not only increase the extent of the injury in the bone itself, but in its subjacent membrane.

If an opening is to be made into the cranium to raise a depressed portion of it, why not rather cut out the depressed portion itself, if practicable, and not too large, and save the sound, which will not only lessen the extent of the injury in the bone, but in the membrane? By removing a part of the depressed bone, we probably may with it also remove one principal cause of the irritation of the membrane in the splintered internal table of the bone, and also prevent its increasing, in consequence of detaching it from the sound part of the bone, a circumstance certainly of some consideration in this operation, though not, to my knowledge, ever taken notice of by others.

If the depressed part is too extensive to be altogether taken out, it seldom happens but as much of it may as will answer the end of the operation.

When the depression is of such a nature that it cannot be raised by a partial detachment of the fractured part, or even though no part of the depressed bone can be cut out for the elevation of the rest, still there is no occasion for taking away so much of the sound as is generally done.

In consideration of the variety alluded to in this operation, it is intended here to shew by what means the cranium may be cut, or opened, to answer the end of the operation best. Every new and improved instrument for the purpose is described in the order in which it is used; first, in making a sound perforation in the usual way; then, how to make a narrow or oval one, or how to cut the bone in any other way more suitable to the construction of the part to be operated upon, or the nature of the injury requiring it.

With the instruments I propose, a part, or even the whole of the depression, in many cases, if necessary, may be cut out, without encroaching upon the sound further than what is taken in by the sweep of the instrument, for smoothing or forming the sides of the opening.

The utility of instruments with which we can cut the cranium in such different ways, for the purposes of the Trepan, must be obvious to all who are acquainted with the variety of that operation.

Mr Pott relates a case "where, to extract a piece of the internal table of the cranium, which was separated from the external, and was too large to be extracted by the perforation he had made, he was obliged to perforate all round the first opening with a small Trephine, in such a manner, that each perforation bordered on the other, as that the whole should make but one opening." If, in such a case, the operator could but trace the direction and extent of the internal fracture, which, in some cases, may be done, and had an instrument with which he could cut the external table, in the direction of the fractured piece within, would he not save himself and his patient much trouble, and considerably lessen the danger of the operation, as I think may be done according to the plan here proposed?

Although I have unavoidably made a little addition to the instruments of the operation in question, it is no more than what is really required, in the probable variety of the cases mentioned, for which the profession, to my knowledge, are not yet supplied.

The different forms in which some of these instruments are proposed for the same thing in this operation, are designed merely for the purpose of the operator chusing what he thinks is most improveable, and what, in the opinion of an artist, may be easiest executed for the different purposes they are intended, preferring the simplest and cheapest, if equally useful, to the more complicated and costly, and as I cannot myself, at present, from any kind of experience of my own, decide the preference, I leave the reader to judge for himself.

## THE

# RASPATORY.

Although, in the operation of the Trepan, some Surgeons have now laid aside the Raspatory, being, as they think, either unnecessary, or unfit for its purpose; the perforation will undoubtedly be easier and more expeditiously made, if, before the application of the saw, the pericranium is taken off. But, it being difficult to scrape off as much of that membrane as is merely necessary to prepare the bone for the saw, without an instrument with which we can describe a circle, the Raspatory in common use, being of a triangular form, is therefore very unfit for its purpose; either more of the bone will be denuded by it than is necessary, or the saw, from a sufficient portion of the membrane not being taken off, will be impeded in its operation, so, in the latter case, the instrument uselessly applied.

The instrument proposed will not only take off much sooner what of that membrane is necessary for the admission of the saw upon the bone, but, by doing it circularly, being turned like a pair of compasses, no more than is necessary. An impression into the bone can also be made at the same time by this instrument, deep enough to confine the saw, for turning it steadily at the commencement of the operation, which is then done with difficulty even by an expert operator; so that it will set aside the use of the centre pin of the saw, and also of the perforator.

This instrument very much resembles a cooper's marking iron, the thing that suggested to me the improvement, but is wrought rather differently, the former being turned uprightly, and the latter obliquely. It has two blades, the one scooped like the tool mentioned, and the other plain. Either blade will cut or perforate the bone, but the plain one soonest, which therefore, by way of distinction, we shall hereafter call the Cutter. The scooping blade, according to the original intention of the instrument, being most suitable for scraping off the membrane, we shall call the Raspatory.

This instrument, with the plain blade, will perforate the cranium much sooner than can be done by the saw, and therefore, if used with the saw, will greatly accelerate the operation; beginning with the cutter and finishing with the saw. It is adjusted to saws of different diameters, by means of the slide, to which the blade in use is fixed. On the slide are as many numbers as different sized saws, by which the instrument is adjusted to the saw for use, by placing the number on the slide corresponding with the number on the saw opposite the line on the shank, the saws being numbered for that purpose. The numbers on the slide are also intended to adjust this instrument to curved saws of different sizes, or one flexible saw, accommodable to different arches cut by the cutter, of which hereafter. See Plate I. Fig. 1.

# TREPHINE.

In the Medical Journals of London for December 1802, I published an account of an instrument, with which I proposed to prevent the saw, by screwing it through a trivet, in the operation of the Trepan, from slipping suddenly in upon the brain. But that instrument being complained of, as too complicated in its form, and troublesome in the application, to become generally useful, in September 1803 I exchanged that for another of a more simple form, though upon the same principle as the former, but easier in the application, and which, in the hands of an expert operator, will answer all that is expected of it. But in shewing that form to some of my acquaintances, I found that it was easier managed by one than another; therefore, it being my intention in this Essay to make every thing I propose as an improvement as generally useful as possible, I thought of another form of an instrument for perforating the cranium, which, both for the simplicity of its construction and facility of its application, will not, I presume, be so liable to objection as either of the former. It can be used as safely at sea as on shore, and will be particularly useful to those who are not possessed of that steadiness requisite for performing such an operation in the motion of a ship. The most timid operator cannot, with such an instrument, be under the least apprehension, in perforating the cranium, of plunging in the instrument, as he formerly was: He must therefore, with this instrument, perform the operation much sooner than he otherwise could. For my own part, I have not the least doubt of its answering its purpose most effectually. This instrument is shaped in the form of a common Trephine, with two rims upon its crown or barrel, the one above the other. The upper rim is about $\frac{3}{4}$ of an inch broad and a 16th thick, and is screwed on. The under is about $\frac{1}{2}$ broad and a 16th thick, and moves easily a little up and down upon the crown. They are separated by a spiral spring round the crown betwixt them, which above is fixed to the upper rim, and below to the lower one. The under rim is made to rise, or approach the other, about the 8th of an inch, by pressing it up against the spring; but, if required higher, or beyond the contraction of the spring, the upper rim is screwed up the height requisite, and the lower one, from its connection with it, also rises.

This instrument is adjusted by the upper rim, which is screwed up or down to raise or depress the lower one; so that the lower one, at first, may be made to stop close to the teeth of the saw or thereabouts, allowing them (the teeth) to project no farther beyond it than what is just necessary to keep the saw in its place while working. See Plate II. Fig. 1.

In performing the operation on the undepressed bone as usual, the place being fixed upon, the pericranium removed, and an impression made into the bone by the Raspatory or Cutter, the operator takes the instrument adjusted in his right hand, and directs its teeth into the impression in the bone, then works it backwards and forwards as he would the Trephine. The expansion of the spring keeping down the under rim, prevents the saw from being suddenly forced in upon the brain, yet, yielding sufficiently and gradually, permits it to rise proportionably to the progress of its teeth into the bone, and in such a way that there is no risk of their being inadvertently forced in too far. The teeth having now penetrated the bone about the 16th part of an inch, or proportionably to the expansion of the spring, the upper rim is screwed up about the 16th of an inch higher, to permit the under one to rise also, so that the saw may penetrate still farther, which is to be wrought again as before, and so on until the bone is cut through. The under side of the lower rim being greased a little with some mild ointment, will move the easier on the bone.

In the progress of the operation the depth of the cut should be examined frequently, and when the bone is cut through in two or three places, or if the membrane appears, which it likely may from the greater width of the cut made by this saw than any other, an attempt should be made to extract the piece. When the bone is cut through at different points, the operator will be better able to judge of the thickness of what is uncut, and consequently what degree of pressure can safely be made by the saw on it to accomplish the separation.

This instrument, with vertical teeth, may also be used as the Trepan, turning it in one way until it has cut all the depth that the expansion of the spring will admit, when the upper rim is to be screwed up, that it may cut still deeper, and so on until the piece is sawn out.

In using this instrument as directed, as a Trepan, or even as a Trephine, cutting both ways, it will be found to cut the bone nearly as fast as the Trepan in common use, though managed with all the dexterity and confidence which the generality of operators using that instrument do.

In operating with this instrument, the operator can be under no apprehension of its sinking in so deep as to injure the brain, or its membrane; even though it should inadvertently slip in, it will not by the depth it can go, press more upon the brain than the common Lenticular.

There is another thing of some consideration in the operation of the Trepan, which may also recommend this instrument still more. It happening, sometimes, that in injuries of the cranium the internal table only is fractured, without any external symptoms to direct our practice, a circumstance which often will not be discovered by an operator until he has got considerably forward in the operation, or till some mischief has been done, however cautious he may be. Mr Bell, indeed, says he met with different cases of it. The danger of operating with the common instrument in such a case is very evident; for, if the same pressure is made by the saw on the internal table that was made on the external, it must force down the separated part upon the brain, an accident which the new instrument, in every case, will most effectually prevent.

## *Perforation of the Cranium by the Cutter and Saw.*

In speaking of the Raspatory, we observed how the perforation of the cranium by that instrument, or the Cutter, in conjunction with the Saw, may be accelerated, or rather by the Cutter, as the principal instrument of the operation, the Saw being only used, as it may be preferred by some to the Cutter, in completing the division of the bone.

In making a round opening, the frame of the Cutter is first to be adjusted to the Saw by the scale on its slide. The operator then takes the Cutter in his right hand, and rests it on the place to be cut out, turning it as he would a pair of compasses in describing a circle in segments, cutting a certain depth in one part, the same in another, until he has cut all round as deep as he intends, or as he can safely, with the instrument resting on the part to be taken out. In using the Cutter, the operator will know when he has perforated the bone at any particular point by a slight check which the instrument will meet with, without sensibly sinking, in turning it, that we do not experience in the use of the Saw. So cautioned, he proceeds to another part of the circle, cuts as deep there, and so on till he has perforated the circle in three or four places, when he removes the Cutter and applies the Saw, which he is to work as directed in the description of that instrument, until he thinks the piece may be extracted by the forceps.

In perforating the cranium with the Cutter alone, if the operator, after cutting a certain depth, is apprehensive he cannot safely proceed farther without a rest for the centre-pin, free of the piece to be cut out, he should use the Bearer, shewn in Plate II. Fig. 2. provided for that purpose, which will support it very conveniently. It is made of a piece of flat iron or double tin, about a quarter of an inch broad, and long enough to project about the 16th of an inch beyond both sides of the circle when laid across it. It has a small hole in the middle to admit the point of the centre-pin of the Cutter, which is to pass through this hole into that of the bone, that the Bearer may not be removed from its place by the working of the instrument. The instrument being thus provided for proceeding safely in the operation, the operator, when he thinks he has cut as deep as he should do with the Cutter, lays the Bearer across the circle, with its central hole over the central hole in the bone, and points the centre-pin of the Cutter through the one into the other, and works as before, the instrument turning the Bearer when in the way of it. See Plate IV. Fig. 4.

Having shewn how, with the instruments recommended, the undepressed part of a bone of the cranium, according to the usual practice, is to be perforated, for the purpose of enabling us to raise the depressed, we now proceed to shew how the depressed portion itself, if not too large, may be cut out, or how a part of it may, for enabling us to raise the rest; and also how a depression sometimes may be raised, by cutting away merely that part of the sound bone by which the depressed in an inverted arch is supported. The additional instruments, by which these different purposes are to be accomplished, will severally be described in their place in the operation. First, then,

### *How to cut the depressed Part entirely out.*

When a depression of the cranium is so confined that the Trephine head will cover it, it is proposed here to cut out the depressed piece itself, rather than extend the injury in perforating the sound part of the bone. This may readily be done with a Trephine, without a centre-pin, resting on the sound part of the bone surrounding the depression, and working it in a circular, (see Plate II. Fig. 3.) which the operator holds in his left hand, while he is working the Saw with his right. When a cut is made sufficiently deep to prevent the Saw from vacilating, the circular is taken off, and the piece sawn out as usual. See Plate IV. Fig. 5.

Some years ago, with the late Mr Courtas, a surgeon of the navy, I attended a young man at Dumfries, who, by running against a lamp-lighter's ladder, drove in about the size of a shilling of the Os Frontis. The edges of the hole being very ragged, were smoothed by a Trephine, without a centre-pin, which was confined by such a circular as the above resting on the contiguous bone surrounding the hole, and wrought in the circular until the cut was deep enough to prevent the saw from vacilating.

If the Rimmed Trephine, without a centre-pin, is used in this circular, it must be wrought without the rims until the circular is removed, when they are to be put on again.

### *When a Depression or Fracture is Longitudinal, and not so extensive but it may be entirely cut out, the Operation is to be performed by the Cutter and a Curved Saw, as follows :*

The operator takes the Cutter in his right hand, and rests its centre-pin on the sound part of the bone, opposite the middle of the depression, so that he may with the Cutter, as with the foot of a pair of compasses, inclose, as nearly as possible, the opposite side of the depression, and cut the depth he means to go with this instrument. He then removes the instrument to the opposite side, and takes in the other half of the depression, either by a wider or narrower arch, so that, by the meeting of the two arches, the depression may be inclosed, and cuts as deep there. The Cutter is then to be removed, and the Curved Saw, (see Plate I. Fig. 5.) to which the frame of the Cutter is to be adjusted, put in its place. See Plate V. Fig. 1.

There is no occasion for being very exact in the measure of the arches inclosing the different sides of the depression. If they are nearly a curve of the same circle as that of the Curved Saw, they should be made to the curve of that saw by which the bone is to be cut.

When it is advisable to cut the bone in a larger arch than can be done by the Cutter or Saw, with the centre-pin resting on the denuded bone, it may be extended on an instrument made for the purpose, of a straight piece of wood or metal, about seven or eight inches long, three quarters of an inch broad in the end, and about a quarter of an inch thick. Under one end are two small pointed props, by which it rests upon the cranium, the other end or handle being held up by the operator or his assistant. In a straight line from the extremity, in the middle, is a number of holes intended for centres of different circles, the Saws being segments of different circles, into one of which the centre-pin of the Cutter or Saw is put when used, the one next the extremity being the centre-pin of the smallest circle, and the one farthest from it, the centre of the largest circle. See Plate II. Fig. 5.

This instrument, when used, is to be placed on the undepressed part of the bone, opposite the middle of the intended cut on the other side. The operator then takes the Cutter in his right hand, his assistant holding up the extender, and places the centre-pin of the Cutter in one of the holes of the extender, and by a sweep of the Cutter on the undepressed part opposite, cuts the bone the length and depth he intends, then shifts the Cutter to the other side of the fracture, resting it where it will be most suitable for making such another cut as will best answer the end of the operator, either for raising the depression or discharging matter. See Plate V. Fig. 2. and explanation of that Plate.

### *When a Depression is too large to be all cut out.*

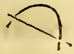
A little of the undepressed part of the bone is to be cut out by the Cutter and Curved Saw at the basis of the inverted arch, where the greatest resistance to the elevation of the depressed part is most likely to be made. If, with an instrument introduced into that narrow opening, the depression cannot be raised, the bone should be cut in another part, nearly opposite the first cut, or where it may appear to answer best, and the elevation tried again and repeated till the elevation of the part wanted be accomplished. See Plate V. Fig. 4. If a wider opening is required for the discharge of extravasated matter than what would be made in cutting off a piece of the sound bone, merely for raising the depressed, an opening sufficiently wide may be cut out of the fractured part, raised and kept up by an assistant holding an instrument, suppose the elevator handle, under it, by the Cutter and Trephine, or by the Trephine alone, confined by the circular, as in Plate V. Fig. 2.

It may happen that after the undepressed bone is cut, a piece of the fractured, about the size of the opening required, may be easily separated from the rest. In that case, the operator will judge whether it is in the place he would prefer for his purpose, and whether another opening need be made in any other part.

## THE

## DIVISIBLE TREPHINE.

The difficulty complained of in working the common Trephine, when the operator is obliged to lean it to one side, may be easily removed, I imagine, by dividing a saw into so many parts. A saw divided has the advantage of a common one, even for the purpose of making a round opening, as it can be made to bear partially on any part of the circle, without leaning it to one side, just by depressing one part of the circle below the rest, and cutting with it. A Divisible Trephine has another advantage over the common one, in being made to cut oval or longitudinal openings of different sizes, by depressing a division of it and shifting the centre, which will answer the purposes of the operation, and in many cases be more suitable than a round one. If unequally divided, and the parts taken separately, it will furnish Curved Saws of different segments on the same radius. The breadth of the part for use is proportioned to the length of the line to be cut; for, if it has not sufficient room to work in, it will cut very slowly. To cut a semi-circle, perhaps a division of 90 degrees may be a very good breadth, and for a curve of 90 degrees, a division of about 40 degrees. Surgeons, therefore, who do not think proper to supply themselves with the different sized Curved Saws, which indeed every one should chuse for himself, for the variety of occurrences in this operation, will, at any rate, find a Divisible Trephine, of about an inch and a half, or two inches in diameter, more accommodable, in many cases, even for making a smaller opening, than a common one. See Plate IV. Fig. 1.

I have but lately seen the Straight Saw recommended so much for cutting the cranium. I think it may be a very useful accessary to the instruments with which it is now proposed to perform the operation of the Trepan in the way mentioned. If there is a difficulty in the management of that instrument, I suppose it is in working it steadily and exactly on the part to be cut, and in making the cut as deep in the ends as in the middle. These difficulties may very easily be obviated, by the operator setting up a piece of wood or ivory, as in Plate II. Fig. 6. edgewise on the part to be cut, and rubbing the saw in its course on the side of it, and running the one course through the other, thus ——| ; but if a straight line to meet a curved, thus  The difficulty of cutting an arch equally deep at its extremities as in the middle, is the same as in cutting a straight line.

The extension of the cuts in this way, for the purpose mentioned, will scarcely be objected, I presume, by those operators who have been in the practice of cutting so much out of the sound bone to raise the depressed.

That the reader may be better enabled

to judge of my method of performing the operation in question, Figures 1. and 2. in Plate V. are two cases of fractures, different in their forms from one another, operated upon, to shew how the fractured piece itself, as in the first, may be entirely cut out; but if too large to be all cut out, as in the second, how a part of it may, to raise the rest by, and discharge extravasated matter under it. The second and third are two fractures of the same form, where, to obtain the same end, the bone is cut in different ways, by different instruments, to shew the operator that he is not restricted to any particular way of performing the operation, but must be guided by his own observation and experience. The fourth depression, being too large to be all cut out, shews how it may be raised by cutting the sound bone bordering upon it, and how the extender is applied to save a large wound in the teguments.

# LENTICULAR.

Among some of the late improvements for abridging the operation of the Trepan, some Surgeons, it is said, have now laid aside the Lenticular, thinking that as the bone may be sawn cleanly out at once, the edges of the perforation will of course be made smooth enough without it. How it is possible, in the perforation of the cranium, so unequal in its thickness, and furrowed so deeply in some places within by the blood-vessels of the Dura Mater, to saw the piece out at once, without lacerating some of these vessels, or otherwise injuring that membrane, which we know adheres so closely to the internal surface of the cranium, is not easily imagined. It is difficult at any time to make the perforation without rubbing the Dura Mater, when in its natural adherent state; for, from the unequal thickness of the bones of the cranium, as has been observed, in most places, one part of it must be cut through before the other, and under that divided part, the membrane, by the usual way of operating, though with all possible caution, most likely will be injured; indeed it is almost impossible to avoid it, and I suspect it is oftener injured than operators are willing to acknowledge or know; therefore, in perforating the cranium, to save the subjacent membrane, the piece should be extracted as soon as there is a possibility of doing it.

Were the operator certain of the Dura Mater being detached by a collection of matter betwixt it and the skull, the piece then might be sawn out at once very safely; but, until some rule is laid down by which we can be assured of that circumstance, the perforation cannot be completed by the saw, but at the risk, or rather certainty, of injuring the Dura Mater, or cutting some of its blood-vessels; and even if the piece was sawn out at once, the lower edge of the perforation would be prickly, and require to be smoothed.

The Lenticular in common use is an instrument apparently better adapted for its use, than in fact it has been found from experience. Were the bones perforated of a softer nature than they are, it might do; but, to cut off the splintered parts that remain, after the perforation of such a hard substance as the cranium, requires an instrument of more power than the common Lenticular, which few operators have the dexterity to apply with the steadiness necessary in that operation. In such a form of the instrument, its cup can be of little or no use in catching the splinters cut off the edge of the perforation, as the unsteady motion of the hand, in using it, must shake them out again. However, if that was all, they could easily be taken up.

In the Medical Journals of London for December 1802, I published the description of a Lenticular for smoothing the edges of a round perforation of the cranium, that being then the only form of an opening had recourse to in the operation of the Trepan I then thought of, or indeed ever knew to be in practice.

It having occurred to me, since the notification of that instrument, that the cranium, in some cases, might be perforated to more advantage oblongly, or otherwise, as the nature of the injury may point out; but as, with the Lenticular mentioned, the edges of an oblong opening cannot easily be smoothed, another form of that instrument is therefore here proposed, with which the edges of an opening of any form may be smoothed very easily. It is upon the same principle as the aforesaid, but of a more simple form, very manageable, and, I think, which is a consideration, will be purchased much cheaper. It is made of a rod of iron, about six or seven inches long, bent nearly into the form of a pair of compasses. It is widened by its spring. The blade is about the 10th of an inch from the points, which are bent outwardly that length, to keep the instrument down in its place, when in the perforation.

This instrument is introduced into the perforation by compressing the sides of it, so that its bent points may be placed under the edges of the perforation. The compression being taken off, the sides, by the force of the spring, being spread, press against the sides of the perforation, so that in turning the instrument in a round perforation, it at once takes off all the ragged and splintered parts. In an oblong opening, it must be introduced at the widest part, and gradually brought to the narrowest at one end, by working one leg a little forward on one side, and the other a little forward on the opposite side, and so on, till they are brought to a point, when about the half of the opening will be smoothed. The instrument is then put in again into the widest part of the opening to smooth the other half, which is done in the same way as the first. In withdrawing it, the sides are compressed as when it is introduced.

This instrument may be made with either one or two blades; but as, in some cases, the splinters may be large, owing to the cut out piece being very forcibly extracted, it will be more difficult to cut them in both sides at once, it may on that account be preferred with one blade. Indeed, the difference of time in doing that part of the operation, whether with an instrument of one or two blades, will be very little.

In smoothing the perforation, notwithstanding all that is done to prevent it, sometimes splinters, too small to be taken up with the forceps, will fall in upon the membrane. The best way of taking them up, is with the end of a small linen roller, dipt into some mild ointment, to which they will adhere.

# ELEVATOR.

The trouble which some Surgeons have met with in attempting to raise the depressed portions of a bone, particularly of the Os Frontis, shews the inadequacy of the instruments in present use for that purpose. The late Mr Hill of Dumfries, a very judicious and experienced Surgeon, in accidents of that kind, met with no less than three cases out of nine, where the depressed part could not be raised at all, either by Petit's instrument, or any other way he could think of at the time.

The method by which it is intended here to raise the depressed part of a bone in such difficult cases, is to screw the Elevator through the top of a Bipes or a Trevit. The Elevatory has a hook, with a rotatory motion, on the lower end of it, which is placed under the depressed part of the bone, and kept there, when the instrument is used, by a small rod of iron fixed to the back of it, and passing squarely through the top of the Tripes, behind the Elevatory, rises with it, but not turning with the Elevatory, prevents the hook from turning, and so keeps it in its place in the act of raising the depression. The prop, whether with two or three feet, is fitted to the unequal convexity of the head by lengthening or shortening its feet, which, for that purpose, are screwed half way down, and pass through the top. The feet are also shifted into different holes in the top, for the further accommodation of the instrument when applied to the head; so all the operator has to do, in the application of it, after it is fitted to the place, is to depress the hook, if too high, and place it under the depression and turn the Elevatory up. Plate III. Fig. 2.

The Tripes of the ancients, according to the description of it I have lately seen in Heister, seems to me to have been designed to act upon the same powerful principle of a screw as the above instrument. But the feet of the Tripes, though made to approach each other, can neither be lengthened nor shortened, to adjust the instrument to the unequal surface of the cranium. The elevatory hook, too, of the Tripes being immovably fixed to the screw, and turning with it, is another difficulty in the way of using that instrument. If its screw is used, it cannot be screwed into the bone sufficiently for a hold of it, without forcing in the depressed parts still farther. In fact, the Tripes, altogether, was found to be so unmanageable as to be justly laid aside.

An Elevator with a screw is objected to by some Surgeons, as having more power than necessary. If it is imagined that too much force may be applied in raising a depression, is a depression that cannot be raised but by a certain degree of force to remain?

By whatever means a depression is raised, I am persuaded, the force to raise it must be the same, whether with the one instrument or with the other. The danger of applying an Elevator with great power to raise a depression, must be in the hasty or precipitate application of it, whereas when gradually applied, there can be no greater risk from it than in the use of any other instrument of less power.

In such apparently difficult cases of depression as have been alluded to, if an attempt to raise them is made by cutting away what of the sound bone supports them, as recommended, we have reason to think that such a very powerful instrument as the Elevator intended will be seldom necessary. In whatever part of the cranium the depression is, there, I think, the bone, on the one side or the other of it, may be cut for the elevation of the rest.

## VERTIBLE FORCEPS.

There is an accident which some Surgeons have met with in the operation of the Trepan, that seems to have embarrassed them not a little at the time, which must have been occasioned by completing the perforation sooner than was expected, that is, the *falling in of the sawn piece.* I never saw such a thing, though I make no doubt of its having happened in such cases, where the Surgeon, expecting a collection of matter under the bone, may, in trying to cut the piece out at once, have let it fall in. But when such a thing happens, I imagine, the piece might easily be taken up again by catching hold of the membrane, which is left on the bone in the inside of the circle made by the Raspatory, with the point of a crooked needle, or a probe. But what will take it up with most certainty, is the Forceps shewn in Plate IV. Fig. 3. They are so thin, that when holding the sawn out piece, both their sides cannot touch the opposite sides of the perforation at the same time. They may be made very well of a piece of tin about the 8th of an inch broad. The feet are made of wire, vertible, and bent to a right angle near the points, and curved to be a segment of the same circle with the saw that cut the bone. In introducing this instrument, the feet are turned so that they may be let into the circle, and when so far in that the feet can be turned under the piece sawn out, the piece is to be raised up with them. See Plate IV. Fig. 3.

After what has already been said on each intended improvement of the perforating instruments of the cranium, a comparative view of them with the old seems to be scarcely necessary. About some of them, I am persuaded, as the Raspatory, Cutter, &c. there will be little difference of opinion in; and after a fair and candid trial of the rest, few operators, it is presumed, will hesitate in also acknowledging their superiority to those in common use.

Although some of the new instruments are more complicated than the old, they are not, on that account, the more difficult or troublesome in the application. The facility with which the Raspatory and Cutter are made to answer their purpose, must be obvious to every one. The Trephine, with the rims, will, I dare say, be found to work as easily as the common one, without them, and must, from its security, give confidence to an operator in its use, and of course accelerate the operation. The advantages of the Divisible Trephine over the common one, are taken notice of in the description of that instrument.

But it is by frequent trials only of the use of these instruments, that any one can be made sensible which should have the preference, or be able to make a choice of them.

Though such a powerful instrument as the Elevator, with a screw, in but a few particular cases, will be required, a Surgeon nevertheless should be provided with it, as he should be for every occurrence in the operation.

That the new Lenticular is better adapted for its purpose than the old, and can be easier applied than it, any person who has but seen it, or understands the use of it, may at once, without any previous trial, be convinced.

It would be of some advantage in the operation of the Trepan, if, in making the perforation, the cut could be made so wide that we could plainly see, by removing the Saw, its progress into the bone. We would then sooner know when the bone, at any particular point, is cut through, and, from its thickness betwixt the holes, what degree of pressure could be safely applied by the Saw in the continuance of the operation. From the straitness of the cut made by the common instrument, we cannot often discover the progress of the Saw, before it has got a greater length than can be done consistently with the safety of the subjacent membrane. By a wider cut, too, we will sometimes discover, from a hole or opening, whether there is a collection of matter betwixt the membrane and the bone, a circumstance, the knowledge of which would considerably accelerate the division of the bone, as, in the case of an extravasation, the piece might be sawn quite out at once.

In making the perforation with the Cutter and Saw, we not only make the cut wider, but do it as soon; for the Cutter, though thicker than the Saw in common use, will cut as fast. Indeed, I am so perfectly satisfied, from some trials I have made, of its preference to the other mode of operating, that I am under no hesitation in recommending it. But the best way of being satisfied of the utility of these instruments, and of the manner in which the operation can be performed with them, is by making some trials of them on a piece of bone or ivory, of equal thickness and hardness throughout.

Whether the operation of the Trepan of itself is dangerous or not, seems with practitioners to be a matter of doubt. But, from whatever circumstance the danger of this operation is supposed to originate, I know no satisfactory reason for imputing it principally to the access of the air into the cranium by the operation.

That the admission of the air is so prejudicial to wounds, ulcers, &c. as has been imagined, I cannot, from my own observation, believe; for I do not recollect of ever meeting with an instance of an abscess, or a wound, which I could positively say became worse, or was injured, by the admission of the air. The troublesome discharge, and other circumstances incidental to the opening of an abscess, we, now, have reason to think, from the improved mode of bandaging and dressing, rather proceed from the mechanical effect of the confined matter being taken off, and the neglect in not supporting the parts properly afterwards, than to the admission of the air. The sudden change brought about by the firm and proper application of a bandage to abscesses, ulcers, &c. shews, very plainly, that it is not the admission of the air that is so prejudicial to them, or retards their cure, so much as the want of a proper bandage. When the air is so prejudicial to wounds, it is observed to be so, in general, very soon after their exposure to it, which seldom or ever is the case in this operation. The inflammation of the membrane, which sometimes takes place after the perforation of the cranium, seldom or ever happens so soon as to be imputed to the admission of the air in consequence of the operation.

May not the inflammation that sometimes takes place afterwards, as likely proceed from the injury it receives at the time of sawing the bone, as from any other circumstance consequent to the operation, in the same way as what takes place in the Iris after the extraction of the Lens?

It has been observed, that an extensive detachment of the Dura Mater from the bone may proportionably increase the risk of its inflammation. But there is another thing as likely to increase the risk of its inflammation, that is, the forcible manner in which that membrane is detached from the bone. An operator, therefore, in his plan of this operation, should not only guard against an unnecessary extensive detachment of the membrane from the skull, but should, if he can, detach it very gradually.

Every body must have observed the facility with which two things adhering to one another can be separated, when the separation is gradually made; whereas, when attempted to be done at once, it is with the utmost difficulty and hazard they can be separated at all. It is therefore intended here, previous to the extraction of the sawn out piece, in the operation of the Trepan, to try to detach the membrane from it as gradually as possible, if the separation has not already taken place by an extravasation betwixt it and the bone. The instrument with which it is intended to make this separation is shewn in Plate III. Fig. 2. It may be made of a piece of wire of nearly the same thickness as the plate of the Saw, about five or six inches long, bent about half an inch at one end into a right angle, and then horizontally curved, so that it may be let into the cut or circle of which that curve is a part, and where the bone is really cut through, is to be introduced, as far in as possible, betwixt the membrane and piece of the bone to be extracted, and turned so as to separate, as far as it can reach, the membrane from the bone. It is then taken out and put into another opening, and a third or fourth if necessary, so that, in the way mentioned, most or all of the membrane adhering to the piece to be cut out may be gradually separated from it before it is extracted.

When, from the nature of the injury, there is an opening sufficient for the admission of the instrument, the separation of the membrane may perhaps be effected before the bone is sawn; and if done then, it will not so likely be torn by the saw, as when adhering to the bone.

It was observed to me by a late eminent surgical writer, to whom the original design of a guard for the Trephine was submitted, "That although it will with much certainty answer its design, of preventing the brain from injury by the Trephine falling in too suddenly upon it, it will require a greater length of time in working than either the Trepan or Trephine; and that any person accustomed to operate, either upon the dead or living body, may easily avoid the inconvenience, which this instrument is intended to obviate; and that no Surgeon ought to operate, who has not had many opportunities of dissecting and performing operations upon dead subjects before."

Although there are practitioners who may think a guard for the Trephine unnecessary, there are many more, I am persuaded, who think otherwise. However, if the proposed instrument will but enable the timid and inexperienced operator, that is, the majority of operators, to proceed, in such a nice and hazardous operation, with greater expedition and safety, than, from a want of confidence in his own dexterity, he otherwise would, one very important end is gained in the improvement. If no Surgeons were allowed to perform this operation, but those who have had opportunities of dissecting and performing operations upon dead subjects, what must become of the greatest part of mankind suffering under such injuries, who, from their situation and circumstances in life, are obliged to employ such Surgeons as they can get? For, comparatively speaking, how few Surgeons indeed have had the opportunities mentioned, and yet how many are there, who nevertheless, from a practical knowledge of their instruments, and the anatomical knowledge necessary, have been enabled to perform the operation in question very dexterously and very successfully, as well as other operations they were occasionally employed in.

It is undoubtedly of very great advantage to a young man, who, in the progress of his education, has had all the opportunities mentioned. Much, however, it must be allowed, has also been gained by industry and application, and a practical knowledge of the instruments of the operation, without such opportunities.

Another thing to be considered in this operation, is, that many men, with all the opportunities mentioned, and even possessed of all the necessary dexterity for performing the operation in question on a dead subject, are nevertheless very diffident in doing it upon the living, from an apprehension of plunging in the instrument upon the brain, an accident which the aforesaid instrument is intended to obviate.

Whatever may be the opinion of a few self-sufficient practitioners respecting such securities in this operation, the numerous contrivances which have been offered to public observation, by Surgeons themselves, to prevent the Trepan Saw from falling in upon the brain, is a convincing proof of that circumstance being so generally dreaded, and how very acceptable a method, by which that operation might be done with safety and confidence, on the part of the operator, would be.

I am persuaded that too many practitioners, under a dread of performing particular operations, which they have seldom been in the way of, have left their patients to their fate; and in no case, requiring confidence or resolution in a Surgeon, has such culpable omission oftener happened than in injuries of the head.

It should be a rule in all intended improvements, for the use of the public, or particular professions, to consider rather how such improvements can be made useful to the generality than to a few; so, in the improvement of Surgical Instruments, we should consider rather what Surgeons are than what they should be. It is not, whether such a supposed improvement as the above will be of use to a few experienced practitioners, but whether those, that is, the greatest part of the profession, who have had little or no experience in the operation in question, will the more confidently, with such security, undertake it, or perform it better than they otherwise would.

It is not the most eminent of the profession who have the best opportunities of knowing what the generality of Surgeons, in private practice and in foreign stations, are. Many young Surgeons, it is well known, get into very extensive employment, from particular circumstances in their situation, without any or very little practical knowledge whatever. It cannot therefore be surprising, but that Surgeons so situated must sometimes feel the weight of their responsibility, particularly when about to perform such an operation as the Trepan, and that they gladly would accept of any thing offered, by which they might perform it with safety.

Experienced Surgeons, therefore, who think that they themselves require no such security or assistance, should not, without good reason, object to what is intended for those who do, unless they can point out by what other means the mischief, or inconvenience, alluded to, can be easier and better guarded against than by what is here proposed.

# METHOD
# OF
# EXTRACTING TEETH.

Why the operation of tooth-drawing, generally so effectual in relieving the afflicted, of one of the most painful and intolerable complaints mankind are liable to, should now be disclaimed by so many respectable Surgeons of London and Edinburgh, and consigned to professional Dentists, when the frequency of the complaint ought rather to make the operation the more generally useful, is rather extraordinary, and the more so, as it requires such a practical knowledge of the complaint sometimes to know whether or not the extraction of the tooth will really answer the end of the operation.

If it is from a persuasion that the operation is better performed by men, whose principal employment it is, and who consequently must be the more expert in it, than the generality of Surgeons, it is a mistake, and they who think so, I will venture to say, entertain a very mistaken idea of the operation.

That professional Dentists have more experience in this operation than Surgeons in general, is allowed; but that all the experience of a Dentist is necessary to qualify a man merely to draw a tooth, will hardly be believed by those who most practise the operation.

Every Surgeon in but moderate practice in the country may have sufficient employment in tooth-drawing if he pleases, which, if he pay proper attention to it, will qualify him for the performance of that operation as well as a professional Dentist. Though a Surgeon cannot, like a Dentist, make up the deficiency of the teeth, he can, as certainly, relieve his patient, which is as much indeed as should be expected of him as a Surgeon.

Why Surgeons therefore should be excused the performance of this particular operation, which is as naturally connected with their profession as any other operation in surgery, appears to me unaccountable.

An interruption to business cannot well be alledged as an excuse for the desertion of their patients in such distress, when the operation for their relief can so soon be performed; neither is the operation by any means so complicated in its nature, nor are its instruments so numerous, as to justify the idea of making it a distinct employment. A Surgeon who pays attention to it, will find no more difficulty in performing this operation than many others to which he is accustomed; some cases may be more troublesome or difficult than others, but that is no more than what happens in other complaints, when we sometimes think it necessary to call in the assistance of others, whom we suppose to have more practical knowledge in such particular cases than ourselves.

From whatever circumstance so many Surgeons in London and Edinburgh have relinquished the operation in question, the evil to be apprehended from it is the same. The consequence most likely will be, that many Surgeons in the country will either follow their example, or, what is as bad, in future, will not bestow that attention to the operation that its importance requires, thinking it an operation, in the failure of which they can lose no professional credit; their seniors not thinking the knowledge of it a professional qualification, they will not themselves be ashamed of their own ignorance of it, and it will, as formerly, be taken up by men of very different professions. The public would lose little by this operation being abandoned by Surgeons, would the country Surgeons but instruct those men practising it in their respective neighbourhoods, in the construction of the parts concerned in the operation; the rest will depend upon themselves. By a little instruction in that way, a man of a clever handy turn, will soon become a very good tooth-drawer, for I believe few but men of some dexterity ever attempt it; in that way the country would soon be accommodated with tooth-drawers as capable of performing the operation as Surgeons themselves. I am under no hesitation in saying, from my own observation, that such men will do more to acquire a knowledge and expertness in the operation, than many Surgeons ever think of, or will trouble themselves about. It is also observed, that such men take a pleasure in performing it, which is more than some Surgeons do; here and there, as it is, tooth-drawers are found, who, from having had a little insight in the operation, have performed it admirably well, but, unfortunately, it is oftener otherwise. Though such a proposal may be spurned at by some, that is no argument against it; why should not one man learn to draw a tooth, if he be shown the way, as well as another? To learn the art of tooth-drawing, it is not necessary that a man should have a liberal education or attend a college: I suspect but a very few of the most dexterous in that operation have. A knowledge of the construction of the parts concerned in the operation, with some practical instructions which may be obtained in a very short time indeed, is certainly very necessary; his own industry and ingenuity will supply the rest. Some of the most dexterous Dentists were taught no more of anatomy than what was necessary to prepare them for the practice of this operation.

We all know that the operation in question is often performed by men whether qualified for it or not, and all that Surgeons can do will not prevent it; neither will they who employ such men be advised to the contrary: Would it not be better then that an evil which cannot be removed, be lessened, by instructing those who perform this operation to do it well? People in the country troubled with the tooth-ach, cannot so easily procure relief from a professional Dentist, and then it is only to be had at an expence which few people can afford.

With the view of extracting a tooth in as nearly a vertical direction as their forms and connection with their sockets will admit, or nearer it than can be done by the instrument in common use. The following is the description of an instrument for that purpose :

From the form of the teeth, and other circumstances respecting this operation, it is scarcely possible to raise a tooth in the extraction of it directly up ; the instrument, which would otherwise lose its hold, requiring a lateral pull to fix the claw upon it, and, to preserve that hold, a continuance of the pull, in the same lateral direction in its progress upwards. Besides, the decayed state of many teeth will not, without breaking, admit of their being pressed so hard as may be necessary to secure the hold of the instrument in pulling them directly up. The straitness of the mouth in some people obliges us to draw their teeth in a lateral direction, if there were no other objections to drawing them vertically. The expansion of the fangs of the great molares may also be considered an objection to the extraction of them vertically, for when they spread so much, they must, in being pulled, either break or force out their spungy sockets farther than we have reason to think they do, in the usual way of performing the operation, and consequently increase the difficulty of it, whereas, when drawn obliquely or laterally, supposing the fulcrum in the inside, it is drawn something in the direction of the outside fang; the point of the inside fang by the pressure of the fulcrum turning into the socket, by the same action of the instrument, will also rise in a similar way.

Now, if an instrument can be contrived, or the common one so improved as to raise a tooth in the ascent of an arch, which is more than can be done by the common instrument, the operation will become both easier and safer, and the tooth not so likely to be broken, or the jaw so often splintered, as it is in the usual way.

The incisores, canine and foremost molares, having only one fang, might be extracted vertically, if a lateral pull were not necessary to fix the instrument laterally upon them; they must on that account be extracted nearly in the same way as the molares. When the teeth with one fang are not too close to one another, they may, for the most part, be detached from their sockets, by shaking or twisting them; if they can be taken a proper hold of, and turned without risking the others, I do not know a better way of detaching them.

From the nature of this operation then, it will now, I presume, appear, that it is in an oblique ascent only that a tooth should be drawn, and it is in an oblique ascent we now propose to do it, which is more than is done in the usual way of operating.

The instrument proposed is constructed upon a principle to raise a tooth, in the extraction of it, 45 degrees, in place of depressing it, as is done in the usual way of drawing it. But that the reader may be the better satisfied of the preference of the one instrument to the other, I will endeavour to explain the principle upon which the common one acts, and how it is improved to answer its purpose better, so as to raise the tooth the height mentioned.

It appears to me, that the common instrument acts much upon the principle of a cant-hook used in removing a log of wood, which turns the log rather than raises it, turning the one side up as the other is turned down, with this difference, that the tooth being turned upon the process, the roots of the tooth are raised higher than the under side of the log, but the body of the hook is drawn down, which most likely would be broken, did not the upper part of the process yield for its escape.

All the instruments I have seen for extracting of teeth, appear to act upon one and the same principle. They differ in little from one another, except in the shape or direction of the bolster, all of them drawing the tooth, or rather turning it over the alveolar process; for the point of the claw, though raised by the rotation of the instrument, is raised only, as it rises with the tooth in turning the tooth over.

To raise a tooth as high as possible, consistent with the preceding observations on that operation, I directed an instrument to be made with a round bolster, like Savigny's, and to be turned upon a fulcrum, to which it is confined by passing through two rings, one on each end of the fulcrum. The prop of the claw of this instrument, when set, is not vertical, as in the old one, but in an arch of 45 degrees from the vertical point; the claw therefore hanging lower down in this instrument than it doth in the old one, must of course, in the rotation of the instrument, be raised 45 degrees higher than it can be by the old.

Did the tooth not require a lateral pull to fix the instrument upon it, the claw might be hung much lower, or in an arch of 90 degrees, and the tooth proportionably raised; but the ascent from that point is too quick for the claw to take a hold of the tooth, and indeed it is doubtful to me whether, in such an upright position, the tooth could be so easily drawn. To raise a tooth 45 degrees higher than can be done by the common instrument, may by some not be thought such a great advantage of the one instrument over the other; but when it is considered that it is 45 degrees up, in place of 45 degrees down, it must be allowed to make a very material difference, particularly at the end of the pull, as the most important time of the operation. See Plate VI. Fig. 1.

In the application of this instrument, the gum being separated as much as possible from the tooth, the operator passes the point of the claw as low down upon it as possible, and keeps it there with the forefinger of his left hand, while, with his right hand, he is placing the fulcrum, covered in defence of the gum, on the opposite side, so low that the middle part of it, which is the most convex, may press against the gum, almost opposite the points of the fangs, which will facilitate the escape of the tooth.

The pressure of the fulcrum against the jaw so low will sufficiently secure the lower part of the sockets, without preventing the upper from yielding a little for the escape of the tooth. The operator now gradually and steadily turns the instrument, and, in a turn of about 45 degrees, most likely the tooth will be raised.

This instrument can be applied with equal facility to either side, merely by turning the fulcrum, which can be readily done from the one side to the other, as the operator pleases.

In the Medical Journals of London for September 1803, I published a design of an instrument, with which it was proposed to draw a tooth in an ascending arch of 90 degrees, or as nearly a vertical direction as possible; but on a further examination of the principles on which that instrument was constructed, I discovered a defect in it, which then escaped my observation. The above is now proposed as an improvement of that plan.

## EXTRACTING OF STUMPS.

All the instruments I have seen for extracting of stumps, appear to me to be so unfit for their purpose, that I cannot conceive how they can be at all applied to raise a tooth, or a stump, that requires any power in an instrument to do it.

The form shewn in Plate VI. Fig. 6. I made use of for the purpose many years ago very successfully; but it being difficult to apply that instrument to the backmost teeth of some people, Fig. 1. in Plate VII. is intended to supply its place. Its blade is of the same shape as the other's, but its shank is bent, which makes it necessary that an operator should be supplied with two of these instruments, for the right and left side, that is, one for the right above and the left below, and one for the right below and the left above.

In applying any of these instruments, after the gums are sufficiently separated, the operator takes a firm hold of the handle with his right hand, and presses down the point of the blade, the serrated edge undermost, with his fore finger on the back of it, to acquaint him of its entry betwixt the soundest side of the stump and the adjoining tooth, or betwixt the stump and its socket, just where he can best force in the instrument to turn up the stump. The point, being sufficiently depressed, is then to be turned upwards, pressing close against the side of the stump, and describing in its course about a quarter of a circle, sometimes making a fulcrum of the next tooth, if sound, by the back of the blade pressing against it. In making a fulcrum of the next tooth, it seldom happens that the instrument will be made to press against the body of it. It is below the body of the tooth, and against the socket, that the back of the instrument will act. A decayed tooth, which cannot be raised without making a fulcrum of the body of the next tooth, should be done very cautiously, for the body of the next tooth should not be made use of as a fulcrum if it can possibly be avoided.

The handles of these instruments should be of a bulky and octagonal form, that the operator may grasp them the firmer. The distance betwixt the point of the blade and handle should be as short as the easy application of the instrument will admit. One handle may serve both instruments, shifting it from the one to the other as they are used.

# INSTRUMENT

## FOR EXTRACTING

## FISH-BONES, PINS, &c.

## STICKING IN THE

## ŒSOPHAGUS.

As many sharp-pointed substances, such as fish-bones, &c. apt to stick in the throat, cannot, without danger of wounding the Œsophagus, be forced down into the stomach, I have contrived an instrument for extracting such substances, which, I presume, will be found to answer its purpose better than any thing of the kind in present use, and is so very easy in the application, that any person, with a moderate dexterity, to whom its principles have been once explained, need not hesitate, in a case of extremity or distress, to apply it: Hence peculiarly applicable when, in such accidents, medical assistance cannot be immediately obtained.

It is made of five or six threads of cat-gut, nearly three inches long, twisted round the end of a wire that passes through a flexible pipe, and protrudes about 2½ inches beyond its extremity; one end of the twist is fixed to the end of the pipe, and the other to the end of the wire. In its extended form, it is to be introduced so far into the throat that all the cat-gut may be supposed to have got beyond the bone or thing to be extracted. The ring at the end of the handle, and outside of the mouth, is then to be drawn out about an inch to spread the cat-gut, and in withdrawing the instrument the bone will be extracted with it. See Plate VIII. Fig. 1. and 2.

# HAIR-LIP.

From the inconveniences hitherto experienced in securing the contraction of the separated parts, in the operation of the Hair-lip, by pins, it occurred to me, that that part of the operation might be done in a very simple way, as effectually, without any of the inconveniences complained of in the usual practice.

As similar methods, I find, of contracting separated parts, from other diseases or injuries, have been tried long ago, by Heister and others, it may very readily be imagined that I received the hint of this supposed improvement from the old practice alluded to. Allowing that to be the case, if the method, as now recommended, be found experimentally useful, there can be no impropriety, it may be presumed, in introducing it here, as an improvement in the operation mentioned.

In place of the pins in common use, it is proposed to draw the divided parts together, and keep them so, by means of a ligature passed through both sides of the wound, with a bit of firm leather, like a button mould, at each end of it; which operation, when done, will greatly resemble the fasteners made by a pair of common sleeve-buttons.

In applying these fasteners, the cheeks are first to be pressed forward by an assistant, so that the separated parts may be brought exactly in contact. The operator then passes a straight needle with a ligature, knotted at one end, through one of the buttons, then through the sides of the wound, about half an inch from its lips and the other button; he is then to cut off the needle, and draw the thread, which, by the first knot on its end, will fix the first button; and by making a simple knot, and then a slip-knot on an intermediate substance upon the second button, he will fix it also; as many of these fasteners to be applied as the length of the wound may require. A very convenient form of an intervener may be made of a piece of firm leather, about the thickness of a crow quill, and so long, that an assistant may easily hold it in its place until the operator makes a knot upon it, and cuts it off its proper length; or one intervener, long enough to reach from one end of the cut to the other, will do for all, tying it on the buttons as they are put upon the ligature.

If the operator wishes to tie the ligatures, so that he can either tighten or slacken them, they should be made of two threads of different colours. The colour of the slip-knot will then shew the threads to be drawn; or if he finds that, from the stiffness of the matter, which cannot easily be softened, it will be difficult to draw the knot, the knot should be made of one half of the ligature, disposing of the other half in the way most convenient, until it may be wanted to supply the place of the other, which it may be necessary to cut the knot of, in the progress of the cure. But, I presume, an inflammation requiring a relaxation of these fasteners, so applied, will seldom or ever occur, as the ligatures, not pressing upon the parts, will not so likely irritate them. The buttons so connected, in proportion to the tightness of the ligatures, press upon the parts, and so resist their retraction. Slips of adhesive plaster applied betwixt these contractors will help to keep the parts the evener.

Glue has also been recommended for that purpose; but I cannot see how it can be made to answer, or be any way useful as an adhesive plaster; and I question whether they who recommended that method ever used it at all, from having taken no notice of the trouble in applying it. It requires two or three hours to dry, and it is not even then to be depended upon, as in the same day it may fall off.

In the case of a greater loss of substance, or a stronger retraction of parts than ordinary, when an operator may think it proper to have recourse to additional means of security, either by adhesive plaster or the uniting bandage, or otherwise, care should be taken, in the application of any of these things, that the buttons are not rendered useless in being drawn or forced forward, by placing behind each a cushion or compress, spread on the under side with adhesive plaster, and high enough to support the bandage and carry it over the buttons without touching them. In such a way, the parts will be well supported without disordering any of the dressings.

To satisfy myself how great a share the buttons, by their resistance or pressure, have in securing the divided parts in the operation of the Hair-lip, and what little effect the ligatures have upon the parts, or sore, even in their tightened state, I cut an angle out of a bit of buff leather, in the form of an opening, or wound, made in the operation of the Hair-lip, and fixed it upon a piece of wood of the same convexity of the jaw, and forcibly separated the sides by a spring, that the more force might be required in drawing them together. The leather was wetted to soften it, that the impression of the ligatures in their retraction, if any, might be the easier seen on it afterwards, and the sides of the angle brought together, and kept so, until the leather was dry, when they were again separated by cutting the ligatures. The impression of the buttons on the leather was very deep, but no impression whatever seemed to have been made on it by the ligatures.

The impression of the buttons on the teguments, in whatever cases of retraction such security may be employed, will be proportioned to the size of the angles betwixt the buttons and the threads, when connected to the parts to be secured; and the deeper the impression of the buttons on the teguments, the less will be the pressure of the ligatures on the sore. In a right angle, the ligature can make no pressure on the parts whatever; and indeed, in a smaller angle, though the pressure of the buttons is oblique, the difference of the effect of the ligature upon the parts is not so observable.

The buttons, in the operation of the Hair-lip, if placed about half an inch from the edges of the sore, or an inch from one another, the angle betwixt them and the thread, from the form of the jaw, will be sufficiently wide to prevent the inconvenience of the ligature cutting the parts, as has been shewn by the experiment mentioned.

The above form of contracting separated parts may be found very useful in cases of more extensive separation, as in the amputation of schirrous breasts, in the extraction of large tumours, &c. A very satisfactory trial of them was lately made in the case of an amputated breast.

These fasteners may also be found very useful in the relaxed or loosened condition of parts, after particular operations requiring a support or contraction, which cannot be effected by bandages or plasters, as in some cases of amputation at the joints, flap operations, and even in those cases of hernea, requiring such a security, they may, if properly managed, be of great use in supporting the parts after the operation. These fasteners or contractors will support the loosened parts, and press them together much closer and firmer than can be done by sutures, &c. in the usual way, without occasioning that irritation which the pressure of the threads against the sewed parts does; the buttons, by their pressure of the teguments, force the loosened parts together, and confine them in the form most suitable to their condition.

The ligature, thus applied, can have no other effect upon the part, than that of an extraneous substance, passing easily through them, which being also smaller than the common ligatures, and consequently easier drawn through the teguments, will irritate them less.

The mode of security herein proposed, when tried, will be found to differ very materially from that by the quilled suture, which it may be supposed mostly to resemble. The crooked needle used in the quilled suture being carried to the bottom of a wound, draws the ligature in a curved line along with it, a direction evidently very unfit for preventing the retraction of parts, which, if so disposed, will continue retracting until the thread is tightened or drawn into a straight line betwixt the quills, cutting all in its way, until it is straight. The quills, therefore, can be of little more use in the cases in which they are employed, than preventing the ligatures from being drawn through the wound, and then by their being fixed in the doublings of the ligatures, the ligatures are spread and enlarge the sore, which in some places might make a very disagreeable mark.

From what has been alleged in favour of the aforesaid plan, for effecting the re-union of the divided parts in the operation of the Hair-lip, and other similar cases of more extensive separation of parts, loss of substance, &c., and also of the same or similar means for supporting or compressing loose parts in particular accidents and operations, I hope it will not be imagined, that I recommend the same method of security in preference to plasters, compresses, &c., when such things can be effectually applied; I am so far from being partial to the mode of security, by stitching and such similar means, that it is a practice I have almost uniformly avoided. It is only intended here to recommend the method alluded to in the cases where such a mode of security would answer its purpose better than any other made by ligatures, as being more effectual, and less liable to irritate the parts, and mark them afterwards, they are applied to. See Plate VI. Fig. 7.

# FISTULA IN ANO.

In the operation of the Fistula in Ano, having previously acquainted ourselves of the course of the sinus, we are directed to pass the probe-pointed bistoury through it, to meet the finger in the rectum; the finger acting as a guide to the instrument downwards, and defending the opposite side of the gut from being wounded in making the incision.

If the external opening is wide enough to admit the probe-pointed bistoury through the sinus, or admit it at all, there will be little difficulty in performing the operation in that way, as far as the finger can reach. But as there are too many cases of Fistula, which will scarcely admit a common probe at its external aperture, or even a re-entrance of the same probe, that was withdrawn but a little before without difficulty, it is not easily conceived by what particular dexterity a curved bistoury, which differs so much in its shape and breadth from a probe, will be passed easily through the same sinus: if there is a difficulty in some cases in introducing a probe, there surely must be much more in introducing a scalpel. The scalpel, from its shape, cannot be insinuated like the probe, or, in any respect, be so accommodable for passing it through the sinus; therefore the operator in meeting with a resistance in the introduction of the knife, which he was insensible of in the introduction of the probe, is apt to be misled, and in danger of penetrating the gut, which is so easily done in another place.

It is difficult to conceive how the bistoury, with the long flexible probe, can be used in making the incision in this operation. The probe must be very ductile indeed, more so than any metallic substance I have any idea of, and can have no elasticity, if the operator, with his finger in the return, can inflict such a length of it, in so confined a place, till the cutting part of the blade gets above the internal opening. I rather suspect more mistakes have happened in the performance of the operation in question, than Surgeons are aware of, or willing to acknowledge.

It has been proposed to perform this operation by means of a canula put up the rectum, which the scalpel, passed through the sinus, is to meet at the internal aperture in the rectum, and to make the incision by drawing it downwards in the canula. But the difficulty of introducing the scalpel for performing the operation in this way, is the same as in the former. If the scalpel could be with certainty run through the sinus and into the canula in the rectum, there can be no risk in drawing it down the canula. The operator, from his own feeling, will perceive when the instrument enters the canula, and, when once entered, it will be easier drawn down the canula than on the outside of it.

Rungius's method, as described by Heister, which is done by introducing the scalpel up the sinus by means of a grooved probe, and cutting down a canula in the rectum, would, in my opinion, be the least objectionable of any, if a grooved probe could be made small enough for the purpose; but that being very difficult to do, or next to impossible, Rungius's method of performing the operation must be confined to the few cases of Fistula that are wide enough to admit the instrument. Heister does not inform us whether he ever saw Rungius perform the operation in the way mentioned or not, or whether he ever did it so himself.

On account of the difficulty in performing the operation of the Fistula in Ano by any of the means mentioned, it is proposed here to make the incision by running a scalpel with a fistular back upon a wire or probe previously passed through the sinus, and drawing it down a canula, which it meets in the return, or by drawing down both together.

### *How to perform the Operation of the Fistula with the Scalpel drawn down the Canula, as proposed to be done by the Instruments shewn in Plate IX. Fig.* 1, 2, 3.

The operator having previously ascertained the height of the sinus, the canula, well oiled, in a straight line with its handle, is to be passed a sufficient height, or its whole length, up the rectum, its grooved side towards the sinus. It is then, in an angular form most convenient, given in charge of an assistant. The operator then takes the scalpel, with the probe passed a sufficient length through its back, and runs the probe up through the sinus and into the hole near the canula's point, which is done by inclining the points of both instruments towards each other. The two instruments being now locked, the operator runs the scalpel upon the probe up through the sinus, and into the canula, which he will know it to have entered by the feel of the instrument. The incision is now to be made either by drawing the scalpel down the canula, or by withdrawing the scalpel and canula together.

We are advised in this operation, not to carry the scalpel higher up the rectum than the finger can reach, without giving any other reason for such a restriction, than the difficulty of performing the operation, without the finger as a guide for the instrument. If there is no other objection against making the incision higher up than the reach of the finger, that objection, I presume, unless the sinus is very high indeed, will be removed by either of the methods now proposed. The height of the sinus, when without the reach of the finger, I suppose, may be readily ascertained by a firm roll of plaster covered with gauze or muslin, and then covered with wax and put up the rectum, which will receive a very exact impression from a probe passed through the sinus, and pointed directly into it. The roller being disengaged, by withdrawing the probe, is itself withdrawn in a direction that will best preserve the impression of the probe upon it, and show the height of the sinus. A piece of liquorice-root wrapt up in a coat of plaster, and covered with gauze and wax, perhaps may do as well as any thing.

## OF

## SAWING OFF THE ENDS

## OF

## DISEASED OR FRACTURED BONES.

Though late experience has proved the possibility of saving a limb under the circumstances of a fractured or disordered joint, which formerly was considered hopeless or lost, the operation for the purpose has seldom been put in practice. One objection to it undoubtedly is the largeness of the wound, which, in the present method of cutting the bone with the common amputation saw, is unavoidable. It is therefore proposed here to perform this operation in a way which will not require such a gash of a wound for the admission of the saw upon the bone, as the means, by which the bone is proposed to be cut, can be used without a cross incision in the middle, or, at most, with a cross incision at each end of the longitudinal one, no longer than the diameter of the bone to be cut, including the width of the opening made by the separation of the teguments in the longitudinal incision.

In performing this operation in the way intended, a longitudinal incision is to be made as far above and below the joint as the nature of the case may require, or what will make the cut wide enough, when the sides are separated for the easy admission of the saw to the bone. The teguments are then, with a broad-pointed curved scalpel, shown in Plate VII. Figure 3, to be separated from the bone, first on one side and then on the other, beginning at the widest and most convenient part for introducing the instrument, and sliding it along the bone as far up as where it is to be sawn. The fleshy and ligamentous parts being now completely separated, the bone may be cut in different ways, either by the curved saw, in Plate I. Fig. 5, confined by the circular shown in Plate VIII. Fig. 5, to defend the teguments from the friction of it, or with the circuitous saw shown in Plate X. Fig. 1. The circuitous saw will be easier applied, and take up much less room for working it in than a straight one. The blades are made to pass one another like a pair of scissars; though they do not make the cuts exactly meet, they will nevertheless cut close enough to divide the bone. The two blades might be made to cut exactly opposite to one another by letting the shank of the one into the shank of the other, but then the bone could not be cut without two saws at least of different curves, the second the least curved on account of the meeting of the lower end of the blades. As the blades of either form, unless so thick as to cut very slowly, will not be easily managed without something to support them, in Plate VIII. Fig. 4, is an instrument to support the blades, and bear off the teguments a proper distance from the bone, and defend them from the friction of the saw in the operation; it is made of two pieces of leather, as thick as the blades are broad, which, in the operation, are drawn under the bone and tied firmly down above, by strings in the ends of them; they are placed near enough to one another to support the saw and confine it close to the place to be cut; they are connected by the middle, or under part, by a piece of thin, but stiff leather, fixed on the outside of them, that the saw, in the operation, may pass under as under an arch. The ring next the joint has four or five points on the under side of it, both to fix itself and the other more steadily to the place where these rings are fixed; the teguments are kept asunder to make room for the saw by a linen roller laid across the bone above the upper ring. A saw with a sliding back I think might be made to cut the bone, so that the back might be forced off as the blade cuts its way into it.

With a trepan large enough, in my opinion, the bone might be cut in this operation as soon as any thing; although it would make two cuts in place of one, it would nevertheless complete the division much sooner than imagined, from the confidence with which the operator would work it in comparison to what he would do when perforating the cranium. The sawing part of such an instrument, to make it cut the faster, may be made as thin almost as an operator pleases.

In cutting the femur, the upper part of the thigh must be rested on a firm cushion of a sufficient height, in such a way that the muscles are not pressed forcibly i nupon the bone, and the knee held steadily by an assistant.

What is of the utmost importance in this operation, in my opinion, is the subsequent treatment; there is more art and dexterity required in the management of a case of this kind after the operation, than in the operation itself. The relaxed and hollow parts should be well supported, and the accumulation of matter prevented as much as possible, which, perhaps, will be best done by a whalebone splint, flexible in the middle, long enough to reach above and below the wound, and broad enough to embrace more than one half of the thickness of the limb, where it is applied with a number of tapes on the back of it to tie it down upon the dressings, either firmly or otherwise, as the condition of the parts may direct. The tapes tied above and below the knee will preserve all very firmly, and lessen the accumulation of matter, which in this operation is most to be dreaded. In this way of dressing the wound, the leg perhaps may be bent, and yet prevented from contracting.

If it is wished to keep the leg extended, a splint on the outside of the other, long enough to be tied down at a proper distance from the divided part, will do it, I dare say, very properly.

Whether the capsular ligaments of the joints should be cut out, though in a healthy state, will be decided by those who are most conversant with the operation, who, I imagine, would not think of enlarging the wound, and making the operation so tedious and troublesome, without discovering the necessity of it. I never saw the operation. What I have proposed here, is to be understood merely as a hint to improve it by the means mentioned, in place of cutting the bone with the straight saw, requiring such a large wound for its application.

# OF BANDAGES.

In treating of the advantages which Surgeons will derive from a practical knowledge of their instruments, it would be inexcusable in me to pass unnoticed, the advantage which would also accrue to the younger part of the profession, in accustoming themselves more to the application of a bandage or a plaster, which, it may be naturally imagined by the reader, are also instruments of their kind, and of equal utility with them.

The advantage that Surgery has already derived, particularly of late, from the improved method of applying a bandage or a plaster, as done by Mr Baynton, are now universally acknowledged. All naval and military surgeons who have been on foreign service, in these stations where ulcers are so prevalent and distressing, must admit the superiority of Mr Baynton's method of treatment of ulcers to all others, and, indeed, to be one of the most beneficial improvements of modern Surgery. I am, for my own part, so well convinced of the efficacy of Mr Baynton's method in the treatment of ulcers, &c., and of the number of limbs and lives that have been saved by it, that I have not the least doubt of its succeeding to the utmost of the author's expectation, in every case unaccompanied with a disordered state of the bone, or the general system, however extensive the ulcer may be, provided the proper application can be made. Even in some cases of scrofula, I have lately made trial of it with success, and one of the people with whom it had succeeded in curing a very bad ulcer in the leg, enjoyed better health afterwards than she had done for a long time before.* When

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* When I was first acquainted with Mr Baynton's method of managing ulcers, by Mr M'Genne's letter to the commissioners appointed to take care of the sick and hurt of his

Mr Baynton's method fails in such cases as he recommends it, it is most likely in consequence of the bungling and awkward manner in which the plaster is applied. I am persuaded, so much depends upon the proper application of the bandage and plaster, upon Mr Baynton's plan, that much time may be either gained or lost, in the cure, by the Surgeon's method and dexterity in applying it, and upon that dexterity, in many cases, the cure depends. The dressings in every surgical case, indeed, are of so much importance in the cure, that

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majesty's navy, which the commissioners, in their zeal for the service, sent a copy of to the different Surgeons of the squadron in India, I was not then on board the Victorious supplied with such a quantity of adhesive plaster as was necessary to dress the great number of patients, with such complaints under my care, quite upon Mr Baynton's plan, without encroaching upon the reserve necessary for the wounded in action; therefore I did not pass the plaster round the leg, but fixed a piece on each side, at such a distance from the edge of the sore, that it might be firmly drawn over it, and fixed the distance recommended on the other side. The two pieces in this manner contracting the sore, I found, with a roller well applied, answered as well as if one piece had been passed quite round the leg. Those patients who could not wear a circular without pain, agreed very well with the piece fixed on each side of the sore and drawn over it.

every experienced Surgeon must be sensible of it; an operation may be performed well, yet may fail from the subsequent treatment or mismanagement of the dressings, while an operation that has not been performed so well, or but very indifferently, and where the cure was not likely to be so complete, or was doubtful, has, by proper bandages, succeeded beyond expectation. In some very obstinate and troublesome cases, one improved dressing, according to my own observation, has made the most sensible difference, both in the appearance of the wound, and the quantity and quality of the discharge.

There is a greater variety in dressing, than in operating, and in some cases more dexterity is required in the former than in the latter; indeed, in many operations and wounds, the cure depends more upon the dexterous management of them afterwards, than upon the operation itself. Hence the impropriety of entrusting so much of that important duty to the young and unexperienced, which a Surgeon ought either to do himself, or see done; but it is too often the case that Surgeons think they have done enough in having performed the operation.

It is very difficult to describe the form of a bandage, or direct how it is to be applied, so as to be easily understood. Very little benefit, therefore, I am apprehensive, will be derived from reading particular directions upon that subject; it is only by practice on a bust, or something like the part to which the bandage is to be applied, that any one can become dexterous or handy in that art. All I aim at here is, in a simple way, by a few examples from my own experience, to initiate the young practitioner into the practice of the art, trusting he will acquire the rest by his own industry; and considering that it is such a necessary qualification in a Surgeon, more attention should be paid to it than generally is by the younger part of the profession; there are few things by which a Surgeon will more likely gain or lose credit with the bystanders, than in the application of a bandage.

It is not among the least improvements of modern Surgery, that the utility of a bandage is now not only better understood than formerly, but more effectually, though, in many cases, more simply applied. It is not my intention to enter further into the subject here, than to offer a few simple forms of bandages, which, I presume, will be easily understood from the description given of them. They are as simple as the different purposes for which they are intended will admit, and may be readily altered or improved, as the circumstances of the case, either at the beginning or in the progress of the cure, may require; for, even in the same operation, the form of the bandage cannot always be exactly alike.

In these uncommon and unexpected occurrences, for which no particular form of a bandage can be prescribed, the operator must have recourse to his own invention, which will be the more productive if it has been exercised upon the subject before.

What has experimentally occurred to myself in the application of a bandage, I will endeavour, in a general way, to describe as clearly as possible. As I found the method so successful myself, I make no doubt of its being as successful with others. The plan, upon the same principles, may be improved, but scarcely objected to, I presume.

In dressing either ulcers or wounds, after operations or otherwise, I found it a good general rule to bring or draw the opposite parts as closely and firmly together, and as nearly into their natural forms, as possible, supporting them firmly in the act with the plaster or bandage intended to contract or unite them, unless something in the nature of the wound forbid it. If there are any hollows or sinuses, on which the roller or plaster, in passing over, cannot be made to act, so as to support or compress them properly, place a cushion of a proportionable thickness directly betwixt the teguments and roller or plaster passing directly over such a hollow, or unsound part, so as to confine the pressure upon them, the unsound parts, and thereby promote the adhesion of the sides from the bottom upward.

When a stump or wound, either from the necessary manner of performing the operation, or from the nature of the accident, is uneven, or out of its desired or proper form, try by bandages, compresses, &c. to restore or draw it to its natural or proper shape as nearly as possible, by raising one part and depressing another, as the condition and form of the teguments will direct.

By such a method of dressing, not only the lodgment and accumulation of matter, which retards the cure, will be prevented, but the discharge will be observably lessened and changed by the second dressing. The parts, from being so firmly and equally supported, will also accelerate the cure, in cases which, by another or the usual method of treatment, would be thought in-curable. I have observed, in the worst of curable ulcers and wounds, the most beneficial effects of such a plan from a single dressing.

In abscesses, or wounds of the joints, the cure depends mostly on the method of applying the bandage, so that the pressure may be made on the place most requiring it.

From such a method of dressing wounds, ulcers, &c. the discharge is soon diminished and changed, and their shape improved. It will not be necessary to dress them nearly so often as formerly. They need not be dressed oftener, when they begin to heal, than once in two or three days, and sometimes not so often; for when the parts are well supported, and in a proper form, dressing them oftener than necessary will only retard the cure. The quantity and quality of the discharge, and the effect of the bandage in shaping the cicatrix or stump, are the best criterions to go by.

### *Bandages for the Head.*

The most simple and most useful form of a bandage I know for the head, and which, with a little alteration, may be made to answer the purpose of a convenient retainer for fixing and simplifying most of the other bandages of the head and face, is a plain cap, made to come over the forehead, with a band or fillet on each side, and occasionally one from the back of the neck to tie under the chin. To form this cap exactly to the shape of the head, and to make it better answer the different purposes for which it is intended, it is made wide enough, and furnished with strings, fixed on both sides, from the forehead backwards, as far as the occiput, at a proper distance from the middle or crown of the head, to tighten the cap, so that, when the strings are tied, it will form a neat and close covering for the head, will remain steady upon it, and also confine what is attached to it for other purposes.

This cap, tied under the chin, will be useful for securing the dressings in most cases of the Trepan, and most of the accidents and injuries which the head is liable to. But, when used in the operation of the Trepan, or for wounds of the head, it is slit in the middle from the forehead backwards, to uncover the injured parts and dress them afterwards. There is no occasion for making it so full every way for all purposes. The bandages, for which it is required as a retainer, will best shew where that fulness is necessary, and where not.

In applying this cap in the case of the operation of the Trepan, suppose the patient lying on his back, that he may be disturbed as little as possible, it is, with the slit wide open, drawn under the back of his head, and the fore-part brought forward, so that the side fillet may be tied under the chin; the laps are then, laid one above the other, to be tied firmly down upon the dressings by the strings on each side of them.

In renewing the dressings, the cap need not be taken off unless dirty; the strings only are to be untied, and the laps, which cover the dressings, laid aside to examine the wound, and to be replaced and tied down again as soon as the wound is dressed. See Plate XI. Fig. 1.

### *To retain a Dressing or Compress on the Eye.*

The upper end of the compress is first hung in the inside of the front of the cap by a pin, and tied down with a slip of cloth fixed to the outside of it, carried across the face, knotted on the back of the head, and pinned to the sides of the cap, or, it may be, carried behind and then upwards, and knotted on the forehead. Dressings may be fixed on the nose and lips nearly in the same way.

### *A Bandage for a Fracture in the Lower Jaw.*

Take a ply of cotton, a yard long and about five inches broad, four or five tapes on each end of it, and make it firmer in the middle, by sewing on it three or four additional plies of cotton, of the same breadth, and six inches long. About an inch from the middle, on both sides, fix six tapes, each about four inches long. See Plate X. Fig. 4.

In applying this bandage, the middle is to be held by an assistant as exactly as possible on the apex of the chin, and the tails tied firmly down on the top of the head. The tapes on the outside of the chin are then to be tied above and below the chin. On tying the tapes on each side of the chin, the bandage will be formed exactly to it, and, like a case, preserve the fractured parts firmly in their place. When the tapes are tied on the chin, the bandage should be pinned to the sides of the cap.

In a simple fracture, nothing more is required afterwards than to slacken or tighten it as it may be necessary by the strings on the top of the head, but the pins then should be taken out, and put in again afterwards. This bandage may very well be aplied without the cap. See Plate XI. Fig. 3.

In a compound fracture, to dress the wound, it may be necessary to cut the bandage in two, if a cut above or below the chin is not sufficient for that purpose; but of that the dresser must judge. In whatever way it is cut, it will be best done when it is put on, or at the first dressing, tying the strings as the cut is making.

To dress the sore, it is first to be untied above, or below, as the nature of the accident may point out. If either the whole or a part of the bandage on the chin is untied, an assistant should keep the fractured parts even in their place until the wound is dressed. The bandage should not be taken off the head, or any way altered in its situation there, from the time it was first put on, unless very dirty. As it may happen, in some particular cases, that this bandage may not be thought firm enough to keep the fractured parts even, a few pieces of whalebone, reaching from the one side of the jaw to the other, are to be laid over the parts most likely to rise, and tied on with strings passed through a ply or two of the bandage by a crooked needle near the corners of the jaw, or where they may answer best for fixing the whalebone, down to the form of the jaw.

With such a bandage as this, in compound cases particularly, the dressings may be removed, and the injured parts examined, with less difficulty than with the four-headed roller.

When the splints are used in dressing the wound, they should be drawn back so as to disengage one part of the bandage from the other; in some cases a part of the bandage under the splint may be cut out, and a thick covering put in its place, which can be removed when the wound under it requires dressing.

When one side of the jaw rises above

the other, a piece of soft cork held betwixt the teeth of the highest side and upper jaw, will keep it equal with the other.

The four-headed roller, when properly applied, is a very good bandage in a simple case of a fracture of the lower jaw, unaccompanied with a wound or swelling, but is apt, in the way it is generally applied, to slip off, and when put on very firmly is apt to occasion a head-ach.

Surgeons who are handy in this art, may disapprove of this simple method of fixing bandages on the head and face by means of a cap; I can only say, that in my own experience, I never was at a loss in applying a bandage in that way, and that I found it the easiest and the best; the more simply a bandage can be applied to answer its purpose, certainly the better. There is another thing that ought to be considered in the application of a bandage. It is not how it can be done to a sound and healthy part of the body, as it is generally shown on paper, but how it can be done in a disordered or unhealthy state of it, so as to be easy and effectual. I have seen some very neat contrivances for confining the fractured bones of the lower jaw in their proper place, as it were in a case, but not one which I thought could be easily worn in the disordered state of it.

### *Bandages for Fractures of the Lower Limbs.*

Simplicity in the management of fractured limbs is now very generally recommended. The more simply the surgical art in every respect, indeed, can be practised, so much the better; but Surgeons, in aiming at simplicity, are sometimes too apt to run into extremes, and in nothing more have they done so than in the management of fractured limbs; some, from a prejudice against all artificial means, as they call them, tell us just to lay the limb out upon a pillow, without binding it at all, except with the many-tailed bandage, to which the profession are so partial, which, if not applied immediately after the accident, must be some time afterwards, as if the cure could not be accomplished without it.

If simplicity in the management of fractures be in the use of the many-tailed bandage, the simplicity cannot be in the application of it. When a method is recommended for its simplicity, it should be so clearly understood by all, that there could be no difference of opinion in the matter, which is not the case in the application of the many-tailed bandage, notwithstanding the length of time it has been in use. Though some dexterity and art is required in the management of it, that is not the reason why I object to it; it is on account of the different ways I have seen it applied by different people, some laying it on the outside of the splints, and others on the inside of them, and many I know who never use it at all. From which circumstances it appears to me, that there is as much difference of opinion in its use, as in the manner of applying it; or that it is as much in compliance with custom, as from a persuasion of its utility, that many use it at all.

From reading, I am as much at a loss to understand the proper method of applying this bandage, as by seeing it applied. By the same author, as I take it, we are desired to lay it on the splints, but in his plates to show us how it is applied, the splints, which, according to his notion of tying up a fracture, should be long enough to press upon the joints, are not to be seen at all.

That the many-tailed bandage in the usual way of managing a fracture when applied to the soft parts, is more convenient for supporting them in the disordered condition of a fractured limb than a roller, cannot be denied; but, for my part, I cannot see that either of them do it well, or that either of them can be of any use in cases where a bandage can be applied, which will at once easily support the soft parts, and confine the fractured bones in their proper situation.

We cannot be so sure of a fractured limb being preserved in its proper form, or in any way so safe as when the dressings are formed to the shape of the leg.

The prejudice of some Surgeons against the use of splints in fractures, must be imputed to the unfitness of the splints for their purpose, or to their being tightened too soon.

Splints, if applied immediately after an accident, should not be tightened but as the swelling and inflammation subside; all that is wanted of splints before that, being ust to preserve the steadiness of the limb against the necessary and inadvertent motion of the body, spasms, &c., which two pliable splints, one on each side, will do like a case; the form into which they are drawn giving them sufficient firmness to confine the limb in that way, without pressing hard or uneasily on the injured parts.

As the swelling subsides, and the callus hardens, more particular attention should be paid to the adjustment of the limb, which the splints gradually tightened will preserve.

If we are to judge from analogy, gentle pressure should have some effect in shaping the callus, while it is compressible, as well as the other soft parts, which we know it is so effectual in, as in the shaping of a stump or checking the excrescent parts of a wound, &c.

Surgeons who use splints for the security of a fractured limb, in general, are in too great a hurry in tightening them, and as much afraid of disturbing the limb afterwards when examining it, as if every movement of it should renew the separation. If the callus was both brittle and soft like a bit of half-dried clay, we would have just reason for such caution; but since that is not the case, and we know that it hardens gradually, and is extensible for such a length of time after the accident, we need not be so much afraid of examining a fractured limb as often as the conditions of it may require. If the slight movements occasioned by the adjustment of a fractured limb, were so serious as to separate the united parts, what could be done with disorderly or drunken people, and children, whom we cannot confine so closely; or a person with a fracture of the lower jaw, the motion of which, in swallowing, it is impossible to prevent, that unites as evenly as any other bone; as the callus hardens, it confines the fractured parts closer and closer, until it becomes so firm as to prevent their motion altogether.

In the case of a fractured limb, attended with swelling, inflammation, &c., I did little more at first than lay it out, and fixed one or two splints loosely on it, just so as to secure the limb against accidents, and that I might easily apply what was necessary to relieve the swelling.

I seldom was under any apprehension in removing the dressings of a fractured limb to examine it, or, as the swelling fell, of altering or improving its posture, nor of tightening the splints gradually in the progress of the cure, as I thought they could be borne.

In every case of a fractured femur, the leg was confined with it on a board hollowed out to receive the heel and calf, and well covered with flannel or cotton, that the limb might rest easy on it. On the end under the knee joint, a narrow piece of wood was connected with it, for fixing a piece of saddle leather reaching better than half way up the under side of the thigh or more. This machine, when used, is raised by a pillow, or any thing else put under its joint, so that the leg resting on it, may form an angle of about 120 degrees with the thigh ; in that way, it not only helps to steady the thigh, but, with proper management, to raise and draw out the lower portion of the fractured bone into a line with the upper. A fractured leg was also laid out in an angular manner on a board, and supported by a number of pins set up in a line on each side of it, conformable to the shape of the leg laid in it.*

The splints in general practice, in my opinion, are objectionable both on account of the materials of which they are made, and on account of their being made so as not to be accommodable to limbs of different sizes. Surgeons, therefore, who have not a store of such articles by them, which I rather suspect but a few have, when called upon, in the case of a fractured limb, must wait until splints are made of the size they want them, if those they have do not answer their purpose, or are not large enough to be reduced to the size wanted. Splints made of pasteboard, though they bend very well transversely to the shape of the limb, they cannot be made to do it longitudinally, so as to sit neatly and closely about the joints, and as they are very apt to be broken or crumbled in applying them, they cannot well be used with any thing to moisten the dressing, or in a case that requires frequent examination of the parts under them. Few Surgeons, therefore, I believe, who have been much in the practice of setting fractured bones, will think of making use of pasteboard after they have once had a trial of it, unless it can be had of a very different kind of stuff than what is commonly used for the purpose, or when nothing better can be had.

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* A board with pins set up to confine a broken leg lying upon it in its natural shape, I first saw in the Dumfries and Galloway Infirmary some years ago.

Mr Sharp's splints, such as I have seen, are so very stiff that they cannot be applied close to the limb they do not exactly fit, nor be altered to the different sized limbs they may be wanted for: few Surgeons, therefore, I suppose, will keep a complete assortment of these splints by them.

*Splints made of Wood, glued on Leather,*

Like the pasteboard, are flexible transversely to the shape of the limb, but will not yield to the form of it longitudinally. These splints, nevertheless, are preferred by some, just because they are longitudinally inflexible, and in support of their imaginary preference, we are told from very respectable authority, that splints should, in the case of a broken leg, reach above the knee and below the ankle, should be only two in number, and press only on the joints, and not at all on the fracture.

If splints are so short that they can only press on the fracture, they are certainly very unfit for what they are intended; for without steadying the bones, as has been observed, they may press the parts covering the fracture against the edges and irregularities of it, and thereby do much harm; but that splints of a sufficient length should press only on the joints, I cannot from my own experience consent to. Besides, there are many legs so thick at the calf, that such splints as are alluded to, from being inflexible longitudinally, could not be applied to press upon both joints at the same time, without a force to apply them, which even a sound limb could not bear without uneasiness.

### *Elastic Splints.*

The most convenient splints are those which are made of whalebone, or some elastic wood, incased in canvass or coarse linen, in the same way in which whalebone is covered in women's stays. The whalebone splints sold in the shops are too stiff and unaccommodating to answer all our intentions here, and being very expensive, but a few Surgeons, I suspect, will keep a proper assortment of them. The kind here recommended, are made of whalebone upon an improved plan, as I imagine ; they are thin and pliant every way to the shape of the leg, but nevertheless will preserve the shape of it as firmly as it can be done by the stiffest without any of their inconveniences. They can be tightened or loosened without any trouble whatever, and can be made to bear either equally or partially on the part, as the Surgeon pleases ; and, if a pressure is required on any particular place, to lessen the discharge of matter, or any other purpose, it can easily be made by the introduction of a compress under that part of the splint directly above the place requiring it, without the smallest inconvenience. However thin and pliable the splints may be before they are applied, they become stiff and unyielding when formed to the shape of the leg.

One set of the splints now recommended, can be made to fit adults of different sizes; they are made much thinner than those sold in the shops, and their bones not so close to one another; they are short to be lengthened to the longest limb, and broad to be removed to the smallest. The cases are open at both ends, and considerably longer than the bones they contain, that by them, the splint, when too short, may be lengthened to the size of the limb, merely by thrusting every other splint or bone forward by a wire, almost thick enough to fill the place occupied by the bone.

The splints lengthened in this way, will yield easily to the shape of the leg near the joints, and will take in the ankle in an empty space, made by pushing the outside splints farther on than the middle ones. The empty parts of the case are to be turned back on the outside or under, as the operator thinks most convenient.

When too wide, a proportionable number of bones is to be drawn out of one or both sides to fit it to the breadth required, and the empty sides of the case turned back or below, as the ends are when too long. These splints may, in particular cases, be laid on the tibea without any inconvenience whatever, provided two or three of the bones above it are drawn out. To retain these splints properly in their place, that they may firmly support the limb, and also to relax them when too tight, a piece of tape is fixed on the outside, along the middle of each by cross stitches, so as to make a line of loop-holes close to one another the whole length. Through these loop-holes, in the different splints when they are applied, are to be drawn a proportionable number of tapes pretty close to one another, and long enough to be fastened by a loop knot on one of the splints. The more numerous the tapes, or the closer they are to one another, the firmer the bandages will be made.

The number of tapes, therefore, in such bandages should be proportioned to the intended firmness of the splints, for the closer the tapes are to one another, the less flexible or firmer will be the splints betwixt them. Upon this plan the splints may be made so thin as to be easily applied to the most uneven parts of the limb, and bind it as firmly as the stiffest things that can be made use of. Though they bend easily into the convex shape of the leg, they cannot in that shape be so easily bent outwards. Splints so pliable and well lined with such a number of tapes to fix them, possess all the advantages of the many-tailed bandage, besides binding up the parts more securely. The many-tailed bandage, therefore, will be of no use along with them, for what more do we want of a bandage for a fractured limb, than that by it the limb can be easily and safely received, and that it can be occasionally loosened to examine the injured parts under it with most ease to the patient, and the least trouble to the Surgeon? See Plate II. Fig. 4.

In the management of a fracture upon this plan, any handy person may be taught to dress it sometimes in the absence of the Surgeon, which cannot be so easily done in the use of the many-tailed bandage.

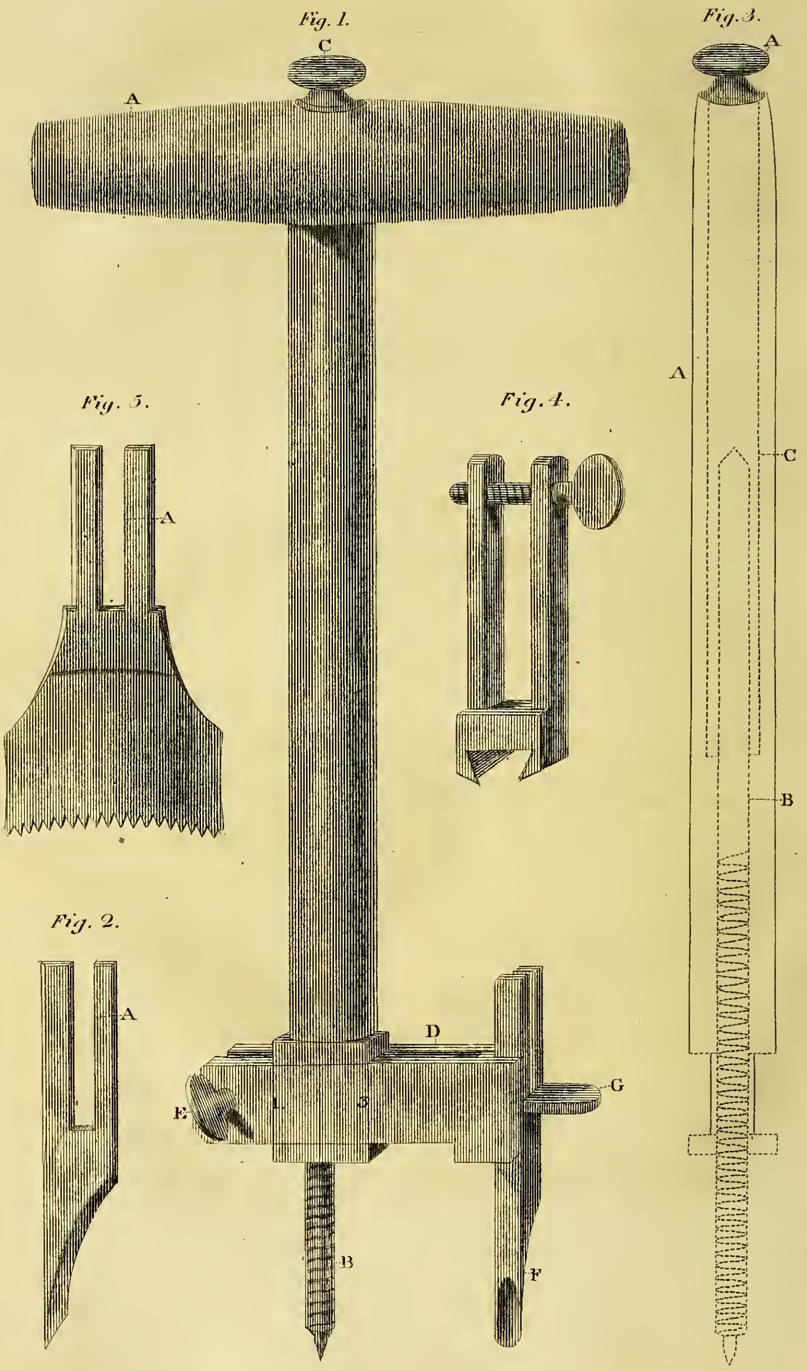
### *To preserve the Extension of a Fractured Thigh.*

The extensible nature of callus is an inducement to us to try the effect of instruments for preserving the extension of a fractured limb.

The objections to contrivances for that purpose, seem to me to proceed from the mistaken manner in which such instruments are applied, and from their being applied too soon: nothing as extenders should be used before the swelling and inflammation have considerably abated. If good splints be properly managed, I imagine machinery will seldom be necessary; for, if the splints may be firmly fixed, the conical shape of the thigh in most people, will prevent the upper end of it, in a case of the bone being fractured, from approaching the lower. In some cases, however, of oblique fractures, or loss of substance, something more capable of resisting the contraction of the limb than the splints, may be thought necessary.

Mr Gooche's machinery for extending the thigh may, I think, be improved or altered so as to answer its purpose much better, and be worn much easier than in its present form; confined to the thigh, it cannot, in a disordered state of it, be bound down firm enough upon the thigh to answer its purpose. It is by means of the extenders below the knee that the extenders above it can be made useful in preserving the extension of the thigh; and it is upon such a plan that we mean to make Mr Gooche's machinery answer its purpose more effectually, that is, by jointing the extenders of the thigh to those of the leg at the knee joint, and with a broad tape bending down the extenders of the leg so firmly below the knee and above the ankle, that they may resist the motion of the upper extenders, and prevent them from slipping either up or down. The upper end of the inside extender is received into a pocket in the middle of a cushion, fixed on the upper end of the inside splint, which prevents its pressing against the neighbouring parts; it is also tied down there and above the knee slightly, by a broad tape turned round it and round the thigh. The outside extender is confined in this same way; the extenders applied in this way have no share in securing the fracture, otherwise than in preventing its contraction.

# PLATE. I.



E. Mitchell Sculp^t

## EXPLANATION

## OF

## THE PLATES.

### PLATE I.

OPPOSITE PAGE 32.

FIG. 1. A view of the Raspatory mentioned in page 29. A. the handle. B. the centre-pin screwed up the shank, which is lengthened or shortened by the screw-driver C. on the handle. D. the adjusting slide to fit the instrument to saws of different diameters, which is done by placing the figure on the slide corresponding with the figure on the saw, opposite the line on the shank, the first adjusting it to the largest

circle, which is 2½ inches in diameter, and the 3d, the smallest, which is a segment of 1½ inches in diameter; but the marks on the slide should be made to adjust the instrument to such saws, as a surgeon chuses to make use of. E. the screw for fixing the slide when set to the saw for use. F. the scraping blade to be used as the Raspatory. G. the screw for fixing the blade or saw in use.

Fig. 2. The cutting blade detached. A. a slit by which it is raised or depressed.

Fig. 3. A section of the Raspatory's shank, to show how the centre-pin is raised or depressed in the inside of it, the centre-pin being squared in the upper end, and rising in a hollow in its driver. A. which is also square, is raised or depressed by the driver without the driver being raised or depressed by it to incommode the operator's hand during the operation. B. the centre-pin running up the driver to C.

Fig. 4. The adjusting slide of the Raspatory detached.

Fig. 5. One of the curved saws mentioned in page 45, for cutting the bones of the cranium in different ways, which is to be fixed to the slide of the Raspatory in the place of the cutter, to complete the division of the bone, after it has nearly been cut through by the cutter. It is raised or depressed by the slit A, as the blades, and is fixed by the same screw. Two or three of these saws curved to the sizes of the different arches to be cut, one of which is the segment of a circle two inches and a half in diameter, another the segment of a circle two inches in diameter, and the third a segment of an inch and a half in diameter, will, so proportioned, I dare say, answer all the purposes of the instrument. By some operators, perhaps, two might be thought quite sufficient. If a blade could be made to bend, it might be set occasionally to a segment of any circle by a screw across it; one saw would thus answer all the purposes of a number. In cutting any depth with the cutter or curved saw, whether with the centre-pin resting on the bone, or otherwise, the centre-pin must be raised as the blade sinks into the bone to keep the instrument upright.

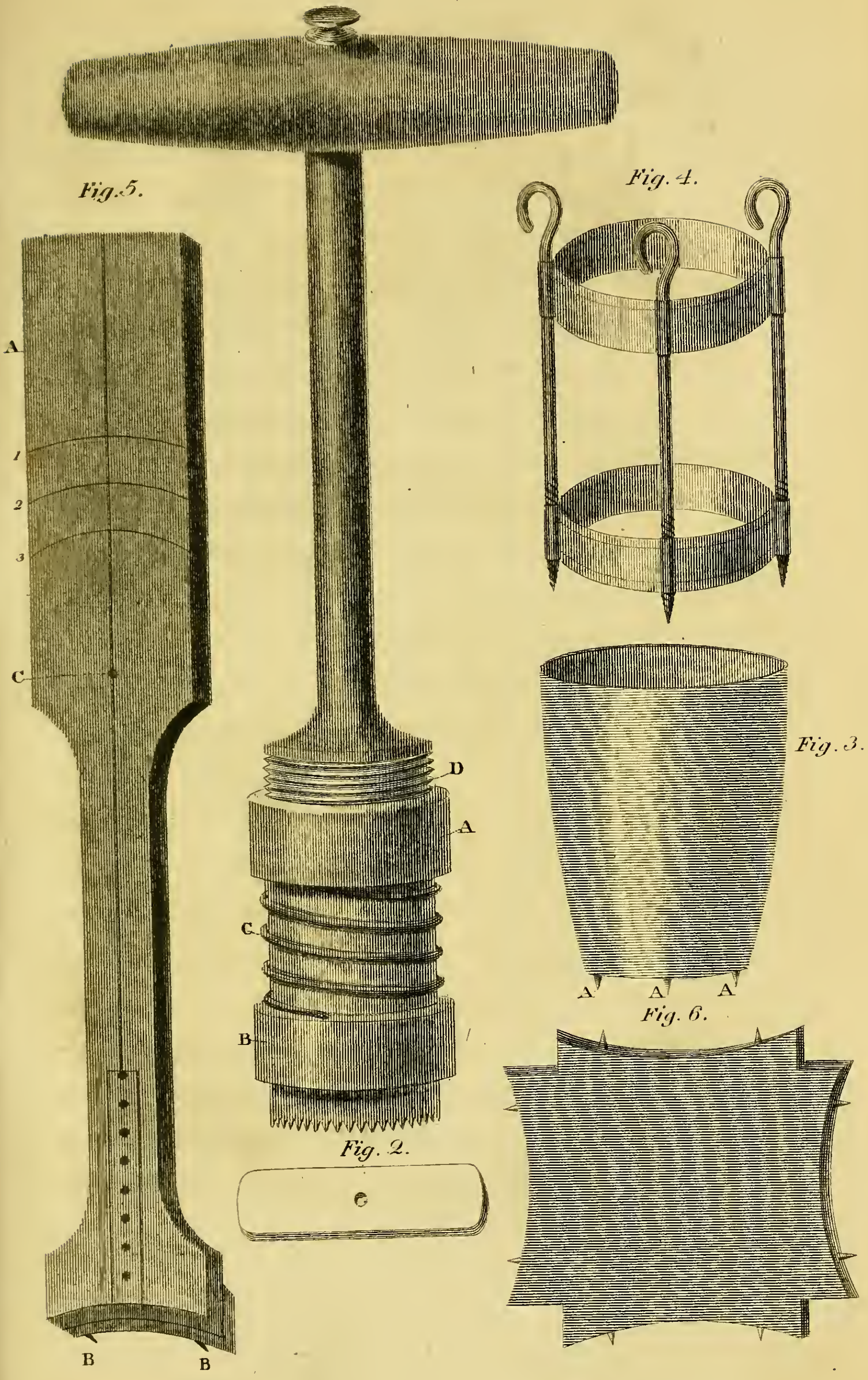
In forming the Raspatory and cutter blades, care should be taken that they are not broader than necessary, or too thick in the back, for the fore and back parts in their course describing different circles, the instrument, after having cut a certain depth, will be stopt by the pressure of the back of the blade against the external bone.

## PLATE II.

OPPOSITE PAGE 36.

Fig. 1. A view of the Rimmed Trephine described in page 33. A. the upper rim which is screwed on the worm D. B. the lower rim, which moves easily up and down, but is prevented from approaching the higher, nearer than the spring C. will admit, so prevents the instrument from being inadvertently forced in upon the brain. To make the under rim move easily upon

PLATE II.



the bone, it should be greased a little with some mild ointment.

Fig. 2. The bearer for supporting the centre-pin of the cutter in making a round opening into the cranium, when pressure cannot be safely made, in the progress of the operation on the piece to be cut out.

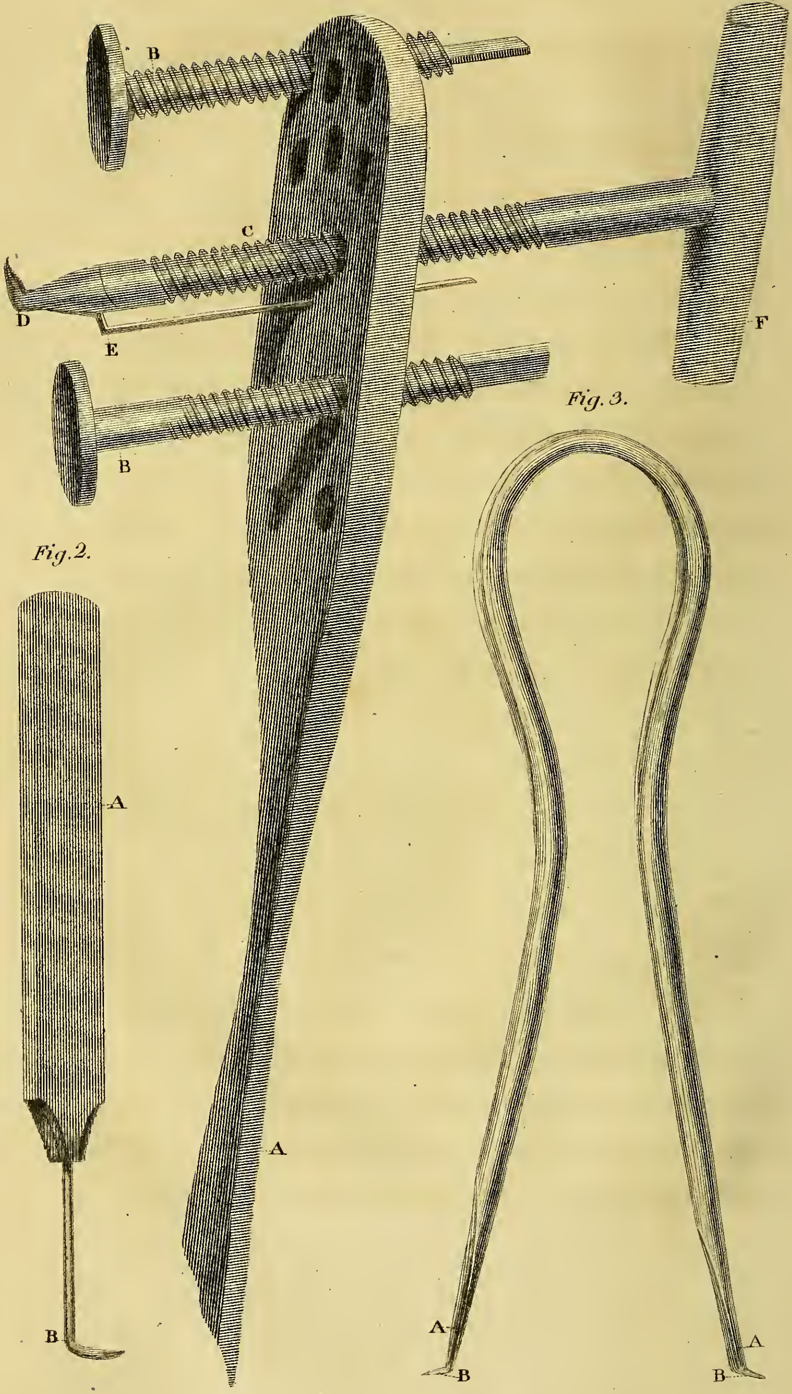
Fig. 3. Shows the circular mentioned in page 43, for confining the saw when wrought without a centre-pin, either for cutting out a depression which it may inclose, or for smoothing the edges of a hole made by accident. It has three points, A. A. A., on its rim, to fix it to the cranium, while the operator is working the saw in the inside of it. Dr Barclay suggested to me a very material improvement of this instrument, by forming it of two rings, segments of hollow cylinders, the one supported above the other by three pillars. The rings being removeable, two or three pairs of different diameters are kept in reserve to fit saws of different sizes, as they may be needed, see Fig. 4. One of the principal advantages of this anular form of the instrument is,

that with it we can see better what we are about in the operation, than with the other made out of a solid piece of wood. It will be more convenient too than the other, in some cases, for confining a Divisible Trephine in cutting the segment of a circle.

Fig. 5. The forms of the instrument mentioned in page 45, on which the centre-pin of the cutter, or curved saw, is rested, when extended; the proportional distance from the blade to cut the bone in a larger arch than can be done with the centre-pin resting on the bare bone. Both sides are alike, except at the extremity, where there are two points on the under end, by which the instrument is kept steady in its place during the operation.

A. the handle. B. B. the two points to fix the instrument upon the cranium; the holes in the line of the middle of it are centres of different circles which the arches, intended to be cut, are segments of; the hole nearest the point being the centre of the smallest circle, and the one farthest

PLATE III.



from the points the centre of the largest circle.

Fig. 6. The Director for the straight saw mentioned in page 50. It is made of a thin piece of wood, hollowed out in the sides, to fit it to the unequal convexity of the head. The points in the sides are to fix it when placed. The angles cut out of the corners are to prevent it pressing on the teguments; when used, it is set up edge-wise, in the direction in which the cut is to be made, and the saw rubbed along one side of it.

## PLATE III.

### OPPOSITE PAGE 60.

Fig. 1. A view of the Elevator mentioned in page 59. A. the handle of the Trevit. B. B. the feet screwed through the top, to be lengthened or shortened at pleasure, to fit the instrument to the unequal convexity of the head. C. the Elevatory screwed through the top on which the hook D. has

a rotatory motion. E. a square bar fixed to the heel or back of the hook below; being passed squarely through the top behind, the Elevator rises with it, but not turning with it, prevents the hook from turning, and so keeps it in its place in the act of raising the depressed bone. F. the handle of the Elevatory; the different holes in the top are for shifting the feet, which are turned by the finger and thumb, either above or below the top, to adjust the instrument; the feet being adjusted, the hook on the Elevator is depressed so that its point may be placed under the most convenient part of the depression for raising it. The handle is then turned to raise the hook, which forces the depression up with it.

Fig. 2. The Detacher mentioned in page 71, for separating the Dura Mater from the piece of bone to be cut out in the operation of the Trepan, previous to the extraction of it by the forceps. A. the handle, which is octagonal. B. the blade, which is round like a wire, and forms a right angle with the shank, and curved horizontally to form

# PLATE IV.

Fig. 1.

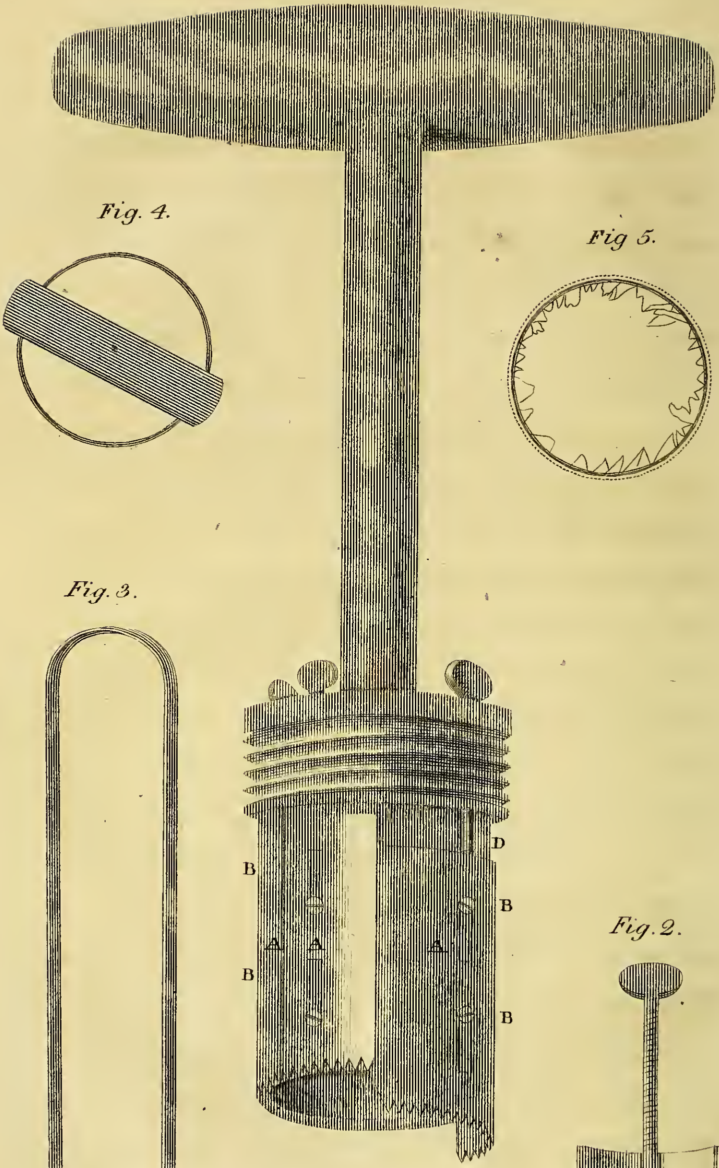
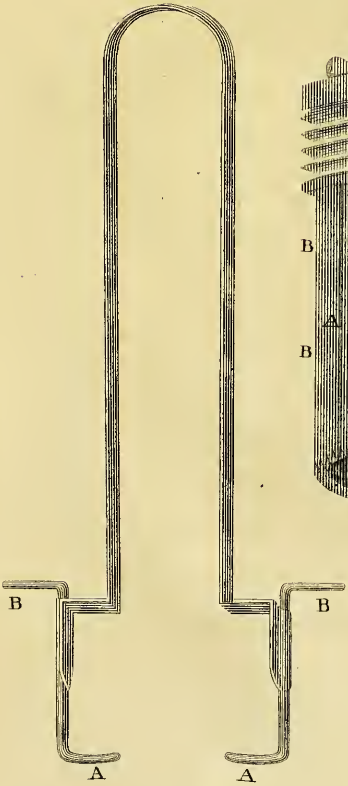


Fig. 4.

Fig 5.

Fig. 3.



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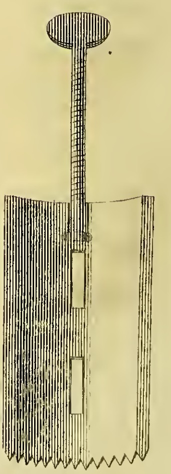


a segment of the same circle as the saw with which the bone is to be cut, and smoothed like the end of a probe that it may move easily upon the membrane.

In a longitudinal cut or fracture, the blade should be made longer and straighter.

Fig. 3. The Spring Lenticular described in page 56, for smoothing the cut or ragged edges of a perforation of any form. A. the blades. B. B. the points bent outwardly to keep the instrument in its place.

## PLATE IV.

### OPPOSITE PAGE 49.

Fig. 1. The Divisible Trephine mentioned in page 49, with a segment of about 80 degrees depressed to cut a semi-circle. A. A. A. A. the screws of the different saws for raising or depressing them as they may be separately wanted. This saw is divided into four parts, but, to make it more accommodable to different lengths of cuts, it

should be divided into more. B. B. B. slits by which the saw for use is depressed; the screws, C. C. C. in these slits are for fixing them steadily in their place. It will seldom happen that in the use of this instrument the operator need be afraid of its slipping suddenly in upon the brain, for the superior or unappropriated part being seldom or ever altogether confined within the cuts in the bone made by the depressed part, it will move down the external bone, and thereby prevent the depressed from sinking too deep. When the intended opening is narrower than the saw, the superior part of the saw, of course, must move along the adjacent sound bone. D. a screw on the head for screwing the rims on, if the cut is so small as to be used in making a round opening.

Fig. 2. A Division of the Divisible Trephine detached to show how it is raised or depressed by the screw on the top.

Fig. 3. The Vertible Forceps mentioned in page 63, for taking up the sawn-off piece, if it happens to fall in upon the membrane, in the operation of the Trepan. A. A. the feet or hooks, which, for the convenience of letting them into the circle, should be a curve of the same circle as the saw with which the bone was cut. B. B. the winch for turning the hooks under the sawn-off piece, which is then brought up upon them.

Fig. 4. A view of the bearer laid across the circle for supporting the centre-pin of the cutter, when the bone is nearly cut through, mentioned in page 41.

Fig. 5. Shows how a depressed portion of the cranium as A. A., when so small that it can be inclosed by the saw, may be cut out by confining the saw in a circular, the inside circle being the cut made by the saw, and the outside one the circular confining the saw.

## PLATE V.

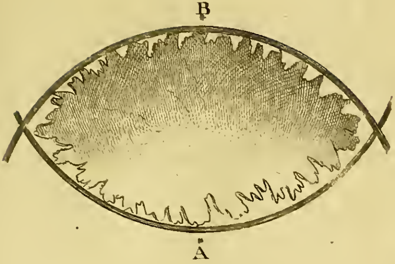
### OPPOSITE PAGE 52.

Fig. 1. Shows how a depression of an oval form may be entirely cut out by the cutter and curved saw, making the points A. and B. the centres of the two lines to be cut.

Fig. 4. A depression too large to be all cut out. An attempt should first be made to raise the depression by an opening at A. made by forcing out the piece betwixt the fissure and the line cut with the straight saw at A. If that attempt fail, another should be made by cutting a curved line at B. which will both lessen the resistance to the elevation, and be of use in raising it; but as for cutting the bone at B., a large incision would be required, and consequently a large portion of the cranium exposed for resting the centre of the instrument upon it; the centre-pin is therefore rested

PLATE V.

Fig. 1.



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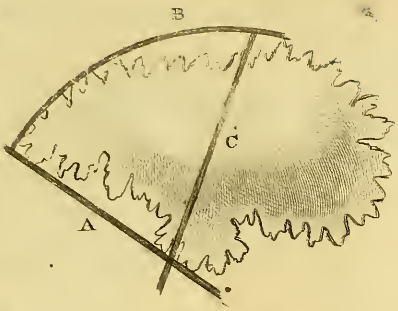

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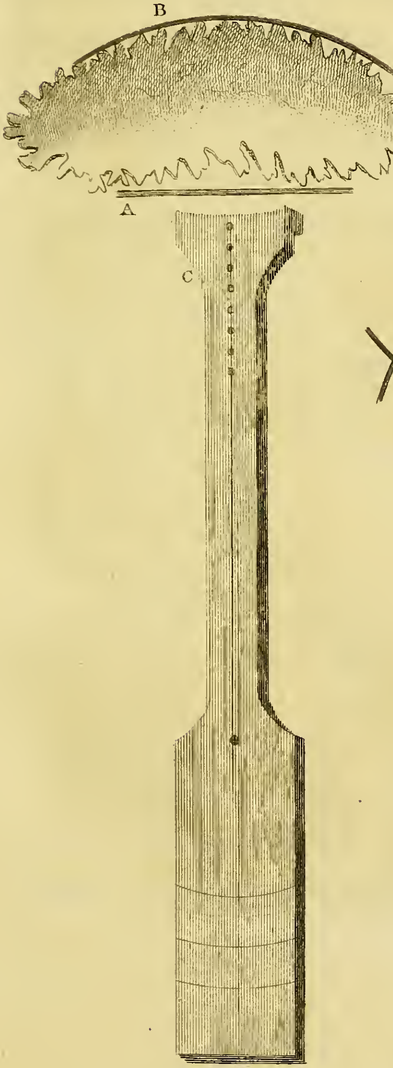
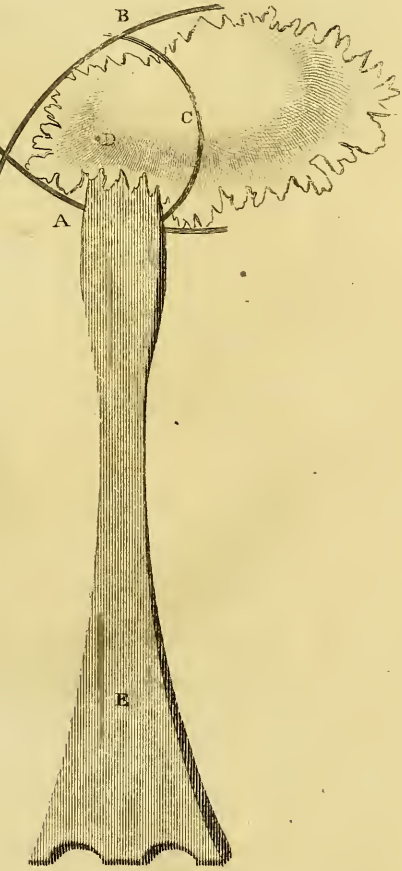


Fig. 4.



E. Mitchell sculp.

on the extender at C., which is the centre of the arch cut in the bone at B.

Fig. 2. and 3. Two depressions of the same size and form, too large to be wholly cut out, to show that the bone may be cut in different ways to answer the same purpose of the operation.

By Fig. 2. an opening is first made at A., by forcing out the piece betwixt the straight cut, and the fissure with the point of the lever shank, or any thing else that will do it; and, if necessary, another piece should be forced out at B., betwixt the curved line and fissure. To discharge extravasated blood, a straight line is cut betwixt A. and B. at C.; the lever being introduced at the opening A. as in the 4th, to support the fractured piece during the operation, if likely to be pressed down by the straight saw after it has been raised.

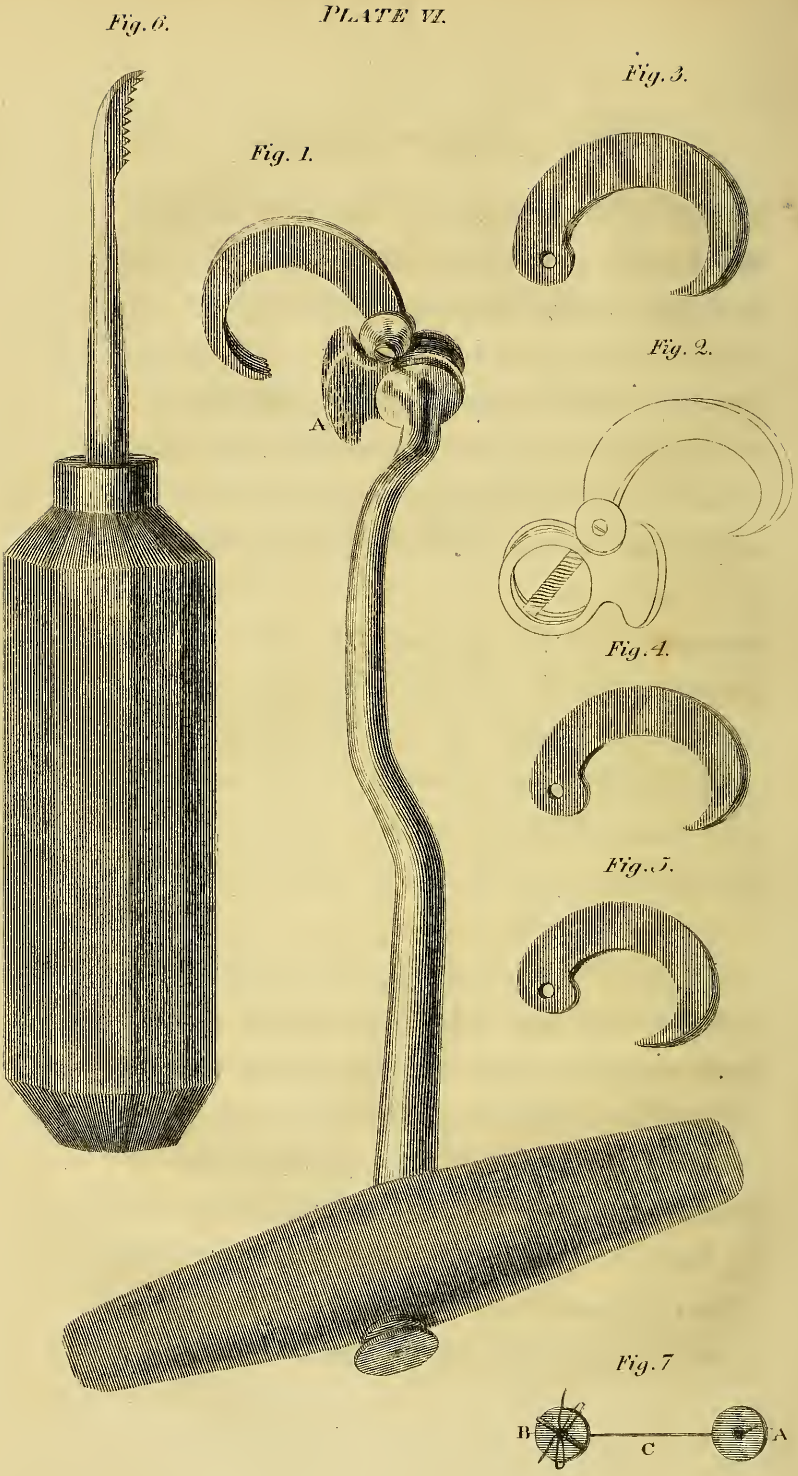
By Fig. 3. an opening is first made by forcing out the piece betwixt the line cut with the curved saw at A. and the fissure; if by that opening the fractured piece cannot be raised, cut a curved line at B., when the piece betwixt that line and the fissure is forced out there, the lever shank is again to be introduced at A., and another attempt made.

To discharge extravasated matter, cut another curved line betwixt A. and B. at C.; the fractured piece being held up, if necessary, during the operation, by the Elevator's handle E.

It may be necessary to remind an operator, that in working the cutter or curved saw on the extender, he must attend to the elevation of the centre-pin as the blade sinks into the bone, to keep the instrument upright, otherwise it will be very difficult to work it.

It may be thought by the reader that some of the curved lines cut in the bone being so near a straight line, a straight saw might have been used to answer the purpose of the operation as well as a curved one, more dexterity being required in the management of the curved saw, at such a distance from its centre of motion, than the straight one, but, as the piece forced out

PLATE VI.



J. Mitchell sculpt

betwixt the line cut by the straight saw and the fissure, in many cases, would not make an opening wide enough for introducing an instrument by, for the elevation of the depressed piece, the curved saw with the cutter is preferred, particularly where the skull is most prominent, and the inverted arch consequently deeper and more difficult to be raised, as in the upper parts of the Os Frontiss, and the middle of the Ossa Parietalia, &c.

## PLATE VI.

### OPPOSITE PAGE 89.

Fig. 1. A view of the tooth instrument mentioned in page 88, for extracting a tooth in an ascent of 45 degrees; the handle should be made of wood, and bulky, to give the instrument more power; the fulcrum A. has a pin on each side of it, (or is formed with a neck) by which a piece of cloth is tied on to defend the gum from the pressure of the instrument during the operation. The string is knotted in the hollow of the under side of the fulcrum.

Fig. 2. The fulcrum detached to show the direction of the prop of the claw through its ring, and through the shank, when fixed upon the tooth to be extracted, which, in its progress upwards, will rise 45 degrees.

Figs. 3. 4. 5. Three claws of different sizes.

Though this instrument is increased a little in its bulk by the addition of the moveable fulcrum, it is not by that addition rendered, as may be supposed by some, more difficult in the application. The increase being horizontally, it will not in that direction by its size, any way embarrass the practitioner in the use of it; at least I can say so from my own experience of it.

Fig. 6. An instrument mentioned in page 92, for raising the stumps of teeth.

Fig. 7. The form of the Fasteners recommended for connecting the divided parts in the operation of the Hair-lip, Hernia, &c. A. B. the buttons connected by

the ligature C., which is knotted at A. and B., as it is when passed through the lips in the operation. The ligature passed first through the button A., is stopt there by the knot on its end; it is then passed through both lips, and through the button B. which is fastened by a slip knot made on an intermediate piece of leather, or any thing else as convenient, on the outside of it. The form of the buttons sometimes will depend upon the form of the parts they are to be applied to. If the operator wishes to tie the ligatures so that he can either tighten or slacken them at pleasure, they should be made of small threads of different colours, and the slip knot made only on two of them, of the same colour, that in case there may be a difficulty in slackening the contracted parts from the tenacity of the matter on the knot, that knot may be cut off, and another slip knot made on the other threads when the parts again can be brought closer. But, I presume, an inflammation requiring such a relaxation of these fasteners, so applied, will seldom or ever occur, for the ligatures not pressing on the parts, will not so likely irritate them.

## PLATE VII.

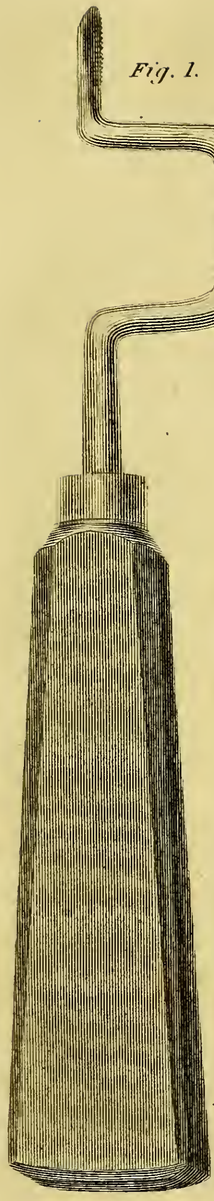
OPPOSITE PAGE 92.

Fig. 1. A lever upon the same principle as the one in Plate VI. Fig. 6. differing from it only in being bent for the convenience of applying it to the back of the mouth; and two of them on account of that bend being necessary, from the blades being sharpened in contrary sides.

Fig. 2. A form of a gum lancet, which I found very convenient for separating the gum from the backmost teeth, which, in some cases, I could not so well reach with the other. The same thing, or something like it, I dare say, may have been used by others; but my never having seen one of that form, I hope I shall be excused for taking notice of it here. It differs from the

PLATE VII.

Fig. 1.



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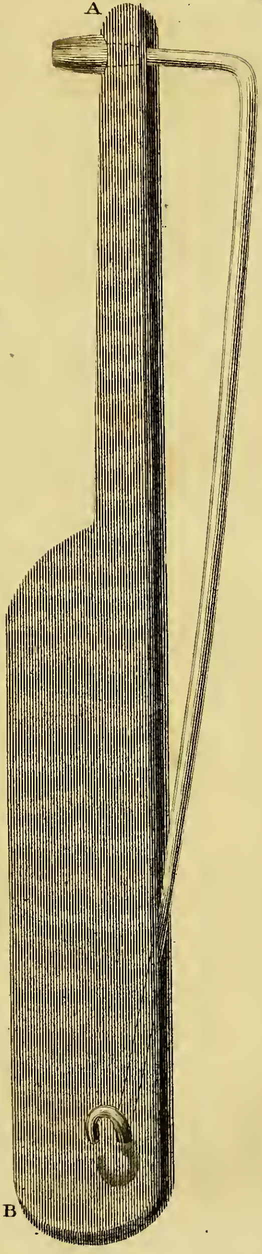

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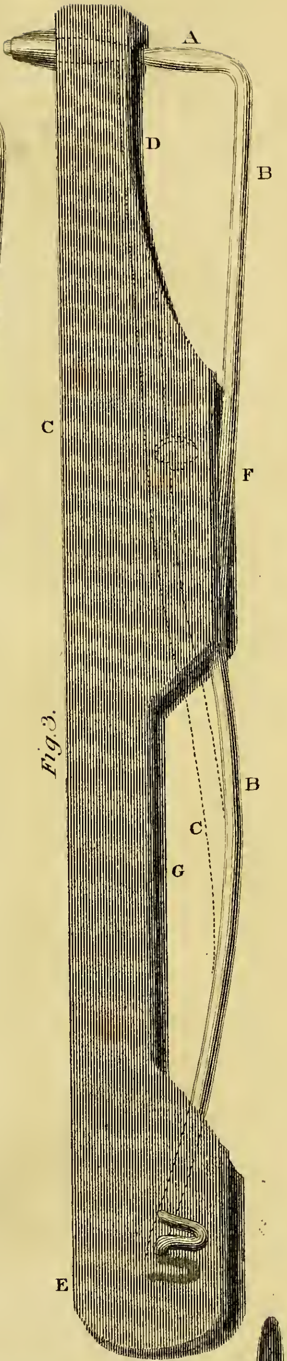

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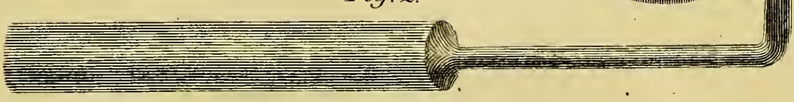

common one only in the side of the blade, in place of the edge of it, forming a right angle with the shank.

Fig. 3. The form of an instrument to convey a cautery into the hole of a tooth to destroy its nerve in the tooth-ache. A. the cautery on the end of the spring. B. B. pointed to pass through a hole in its director at the end of the case C. D. D. a dotted line to shew how low the cautery, with its spring, should be depressed to be safely introduced into the mouth. E. the pivot which joins the instrument to its case. F. a pin to keep down the spring when depressed. G. an opening by which the spring is pressed down to the bottom of the case, to press the point of the cautery into the tooth.

Fig. 4. A form of an instrument for conveying any of the concentrated acids, or strong oils, into the hole of a tooth for destroying its nerve. A. the director, through which the oil, dropt on a little lint or cotton, is pressed by the split end of the spring into the hole. B. the pivot which joins the

spring to the case. The cases of both these instruments are made of wood, and the springs of common wire; the case for the cautery is lined with tin, without any thing to fix it to the wood.

## PLATE VIII.

### OPPOSITE PAGE 96.

Fig. 1. The form of an instrument for extracting fish-bones, &c. sticking in the Œsophagus. A. A. a flexible pipe. B. catgut twisted and fixed on the pipe at C.; and at D. on the end of the wire, passed through the pipe. E. a knot on the point of the catgut. F. a ring on the end of the wire, by which the wire is drawn out about an inch, or the length of its bridle G. to spread the catgut. The bridle may be made of silk thread, fixed to a ring that moves easily about an inch up and down the handle, and to the ring at the end of the handle.

*PLATE VIII.*

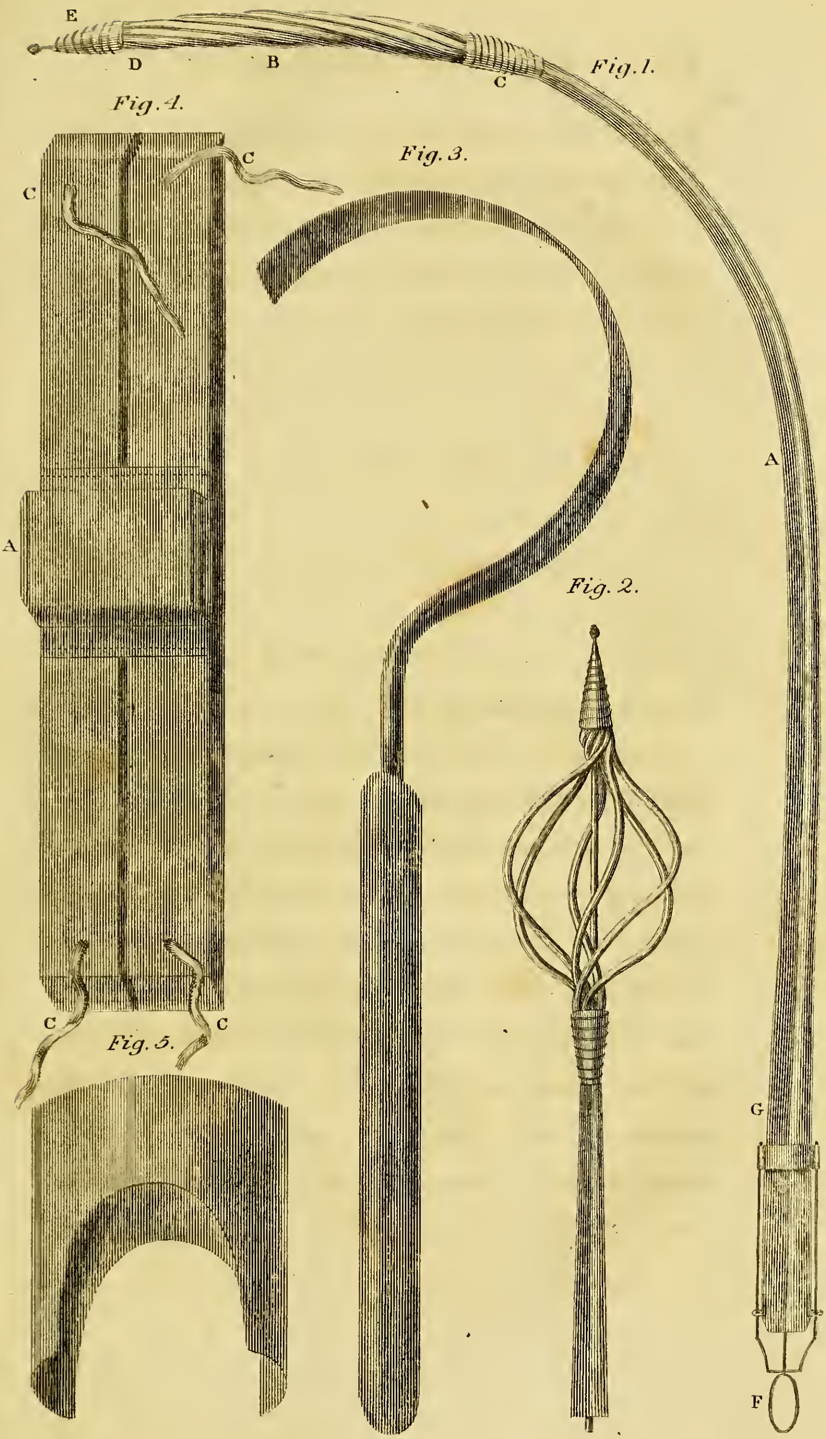

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Fig. 2. The instrument when introduced into the throat, with the catgut spread under the bone or thing to be extracted.

Fig. 3. The form of the curved scalpel for separating the muscular and ligamentous parts from the end of a fractured or disordered bone previous to its removal. It has three edges, which are ground off the convex side. It is first entered by the longitudinal incision, and turned on the bone, so as to separate the half on one side; then at the other end, so that the whole covering of the bone is separated all round, and up the height required.

Fig. 4. The leather circular for supporting the blades of the circuitous saw, and confining them exactly on the place intended; and also for bearing off the teguments such a distance from the bone as will defend them from the friction of the saw in the operation. A. the cross piece which the points of the saw pass under in the operation. c. c. c. c. strings to tie these circulars on.

## PLATE IX.

### OPPOSITE PAGE 111.

Fig. 1. The scalpel with a fistular back, mentioned in page 110, with the probe run through it, as the operator runs it up the sinus for performing the operation of the Fistula in Ano. A. the blade. B. the handle. C. the pipe on the back of the blade, with the wire in it.

Fig. 2. The canula betwixt A. and B. angular at the bottom, and in a line with its handle, as it is introduced up the rectum. C. a ring to keep it in a straight line with the handle. D. the hole which receives the point of the wire, or probe, for directing the scalpel through the sinus into the groove.

Fig. 3. Shews how the scalpel is run upon the probe into the groove to make the incision. That the handle may not be

PLATE IX.

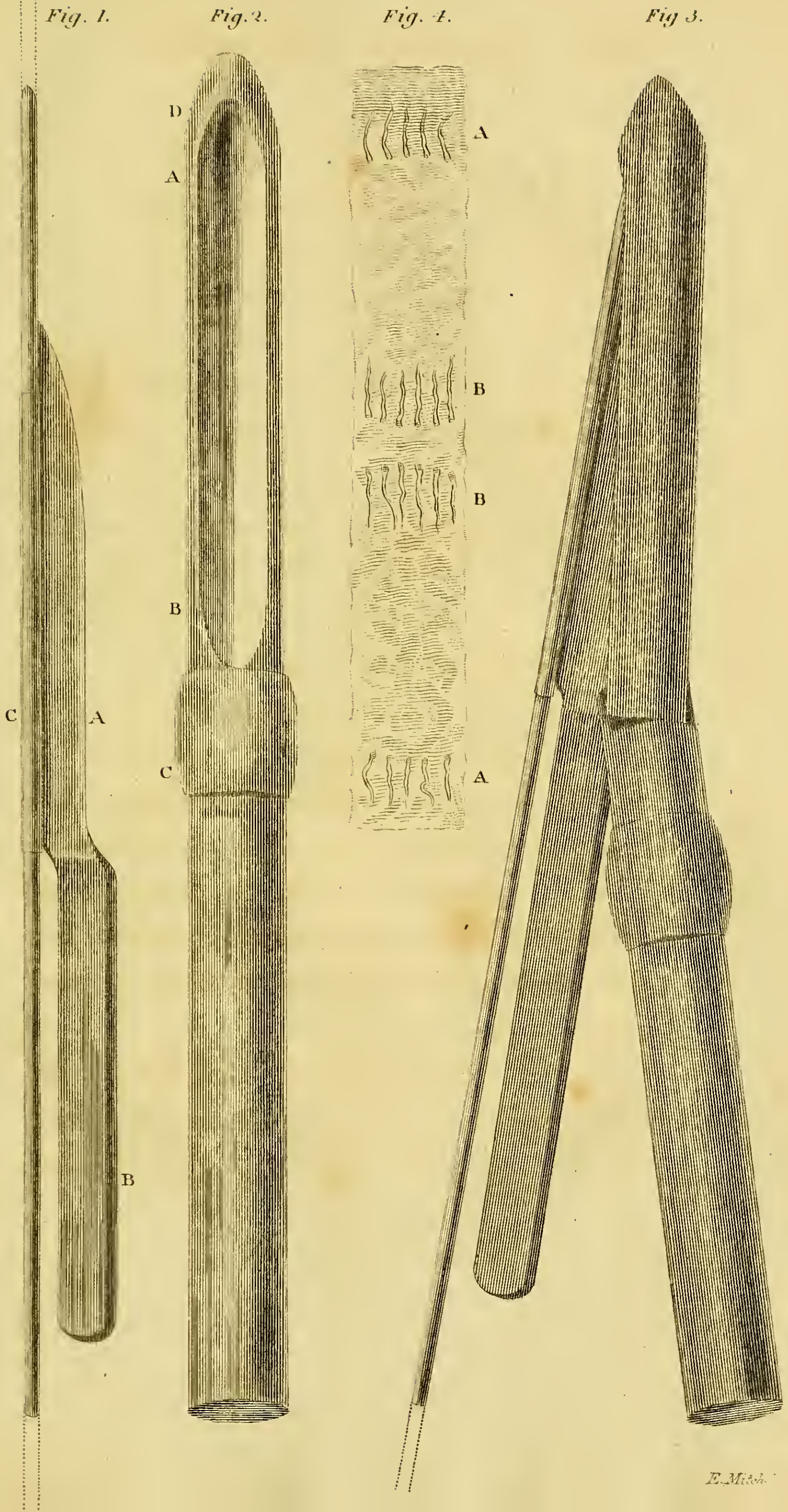

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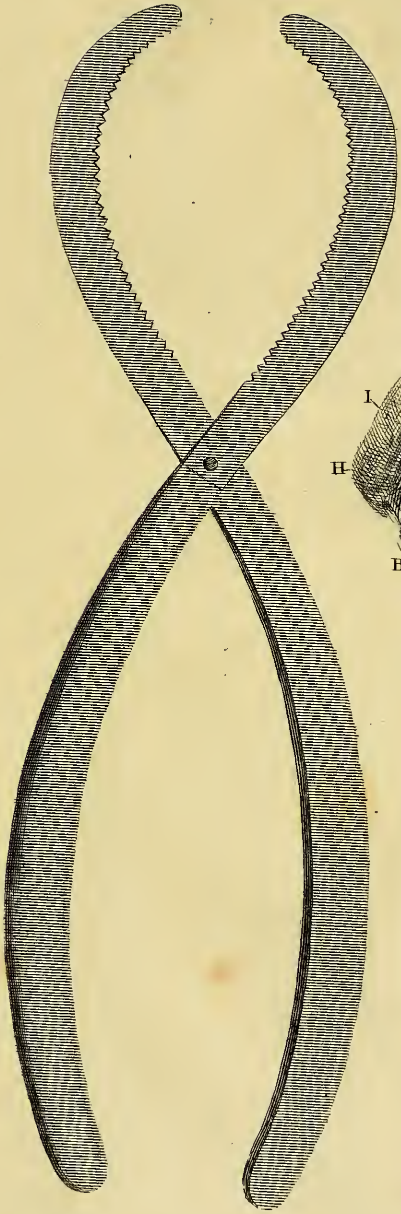
PLATE X.

*Fig. 1.*



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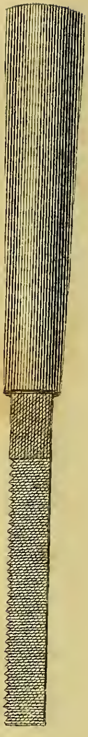

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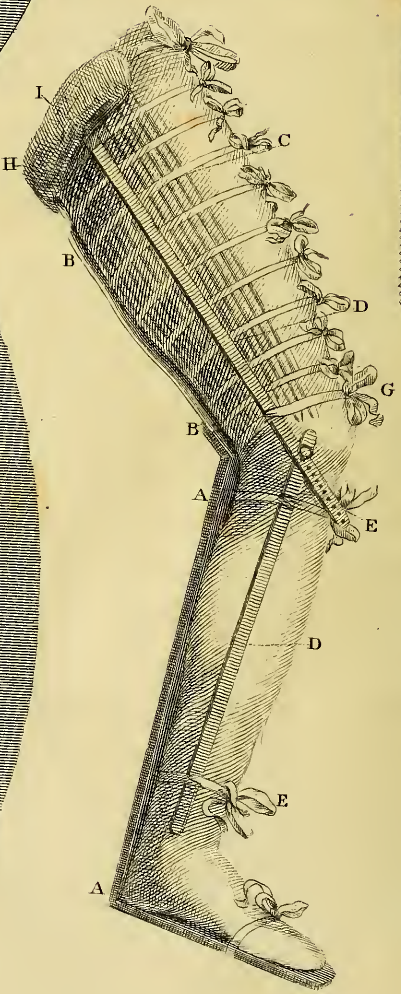


E. Mitchell Sculp.t

in the operator's way when running the scalpel up the sinus, the ring, which keeps it extended, is slidden down, and the handle bent back.

Fig. 4. A bandage for the lower jaw when fractured. A. to A. four tapes by which it is fixed steadily on the top of the head. B. to B. tapes to tie it above and below the chin.

## PLATE X.

### OPPOSITE PAGE 116.

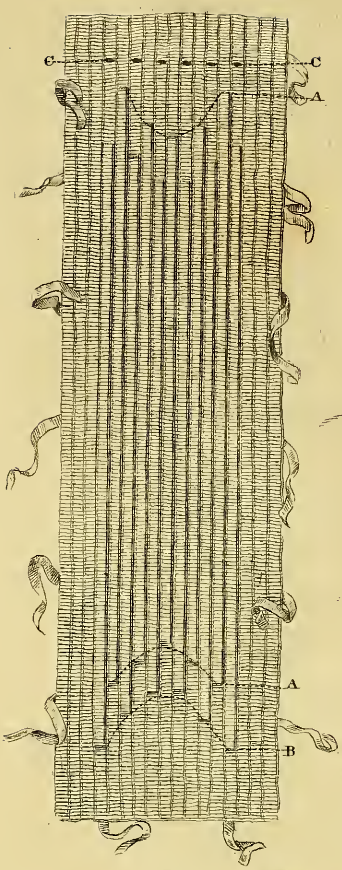
Fig. 1. The form of a circuitous saw for cutting off the end of a diseased or broken bone. One half of this instrument is to be slidden under the teguments before the other, as the curved scalpel in Plate VIII. Fig. 3.; and when both blades are in their place, they are to be joined by a screw, as the blades of a pair of scissars. It is then worked backwards and forwards, so as to

cut quite round the bone. As it cuts the bone, like the scissars, the blades approach each other. When it has cut as far in as the form of the blades will admit, and their lower ends rub on one another, the small saw, FIG. 2. with the teeth of a file on both sides of it, if necessary, should be put in its place to complete the division of the bone.

FIG. 3. The leg and thigh laid out on the support mentioned in page 142, to shew how the extenders, described in page 152, are applied to preserve the extension of a fractured thigh. A. A. and B. B. the support. C. a splint on the inside of the thigh. D. D. the two extenders of the leg and thigh. E. E. the ligatures binding down the lower extender. G. a ligature on the lower end of the extender of the thigh. H. the cushion, with the pocket I. in the middle to receive the upper end of it.

## PLATE XI.

Fig. 4.



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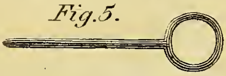

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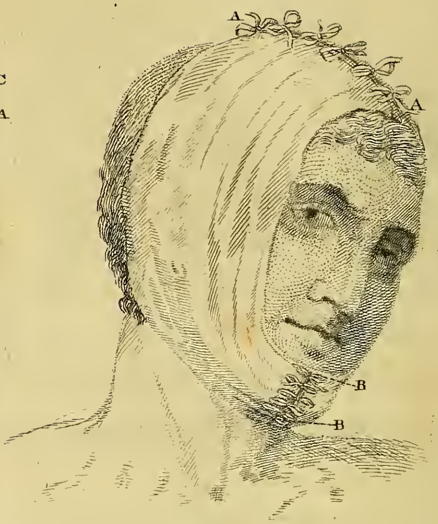

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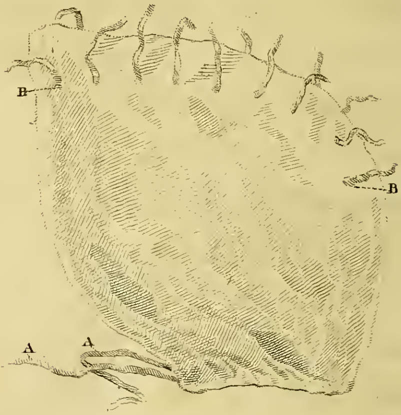

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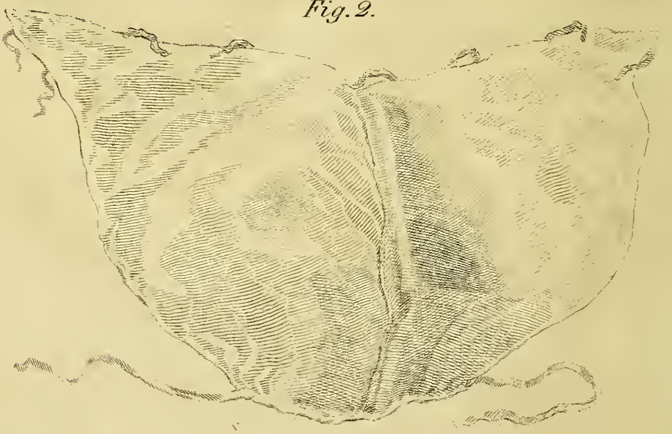

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## PLATE XI.

### OPPOSITE PAGE 132.

Fig. 1. A. side view of the cap for securing the dressings after the operation of the Trepan, wounds of the head, &c. A. two tapes to tie it under the chin. B. to B. tapes to tie it on the top of the head.

Fig. 2. The cap slit and laid open from the forehead backwards as far as the occiput, to draw it under the back of the head without disturbing the patient.

Fig. 3. The band upon the lower jaw fixed on the top of the head by the tapes A. A. and below the chin by the tapes betwixt B. and B.

Fig. 4. A splint to show how it is either lengthened or narrowed. The original length is betwixt A. and A. It is now lengthened to B.

c. c. c. c. c. c. c. Round openings at the upper end in every other case by which the rammer is entered to force down the bones the length required. The breadth of the cloth was the original breadth of the splint, which is now narrowed by three bones being taken out of each side of it.

Fig. 5. The rammer, made of a piece of common wire.

THE END.

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## HISTORICAL, ARCHITECTURAL, AND GRAPHICAL ILLUSTRATION

OF THE

## *ENGLISH CATHEDRAL CHURCHES.*

BY

JOHN BRITTON, F.S.A.

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